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ENGINEERING AND MINING JOURNAL

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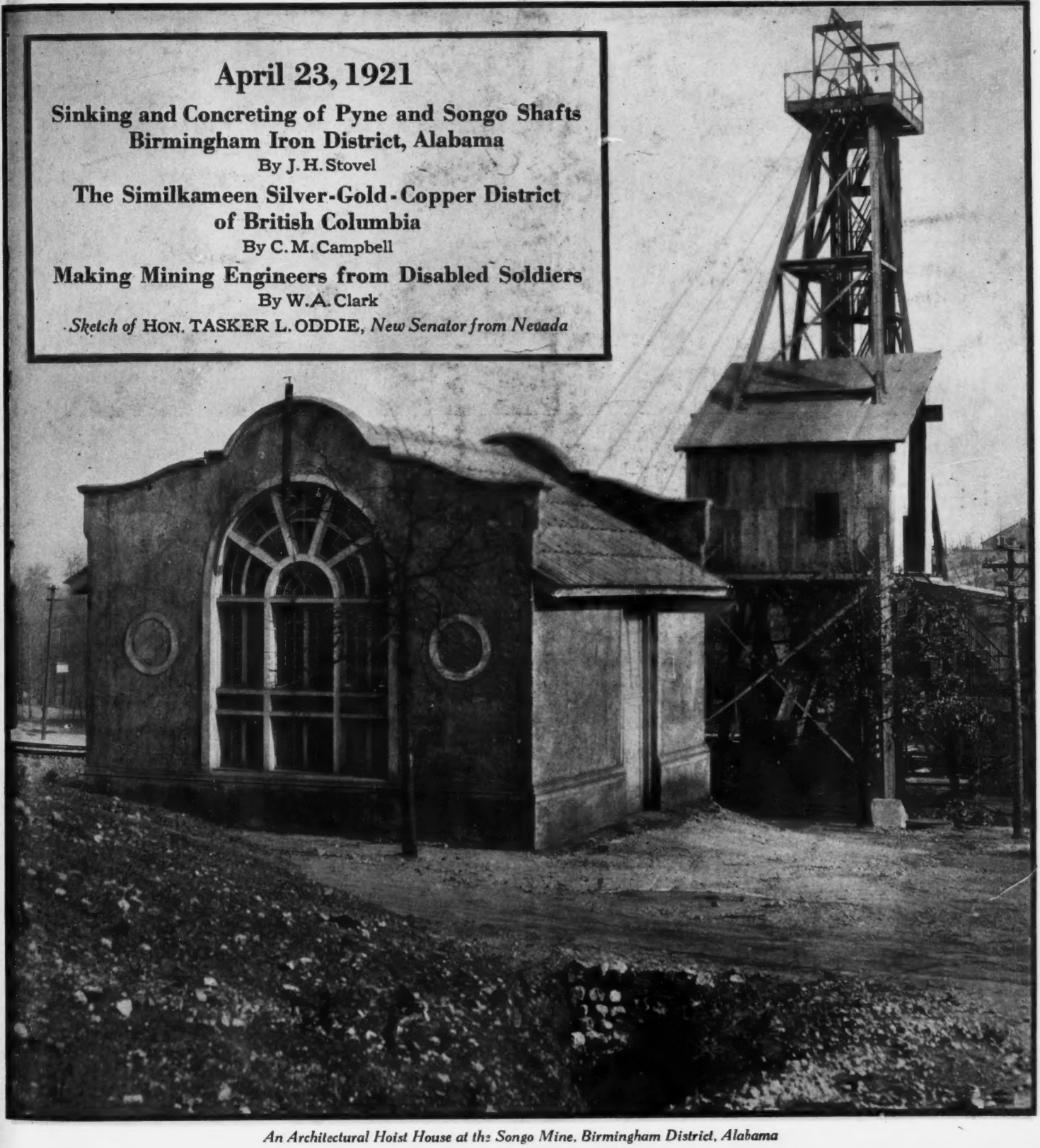
April 23, 1921

Sinking and Concreting of Pyne and Songo Shafts Birmingham Iron District, Alabama
By J. H. Stovel

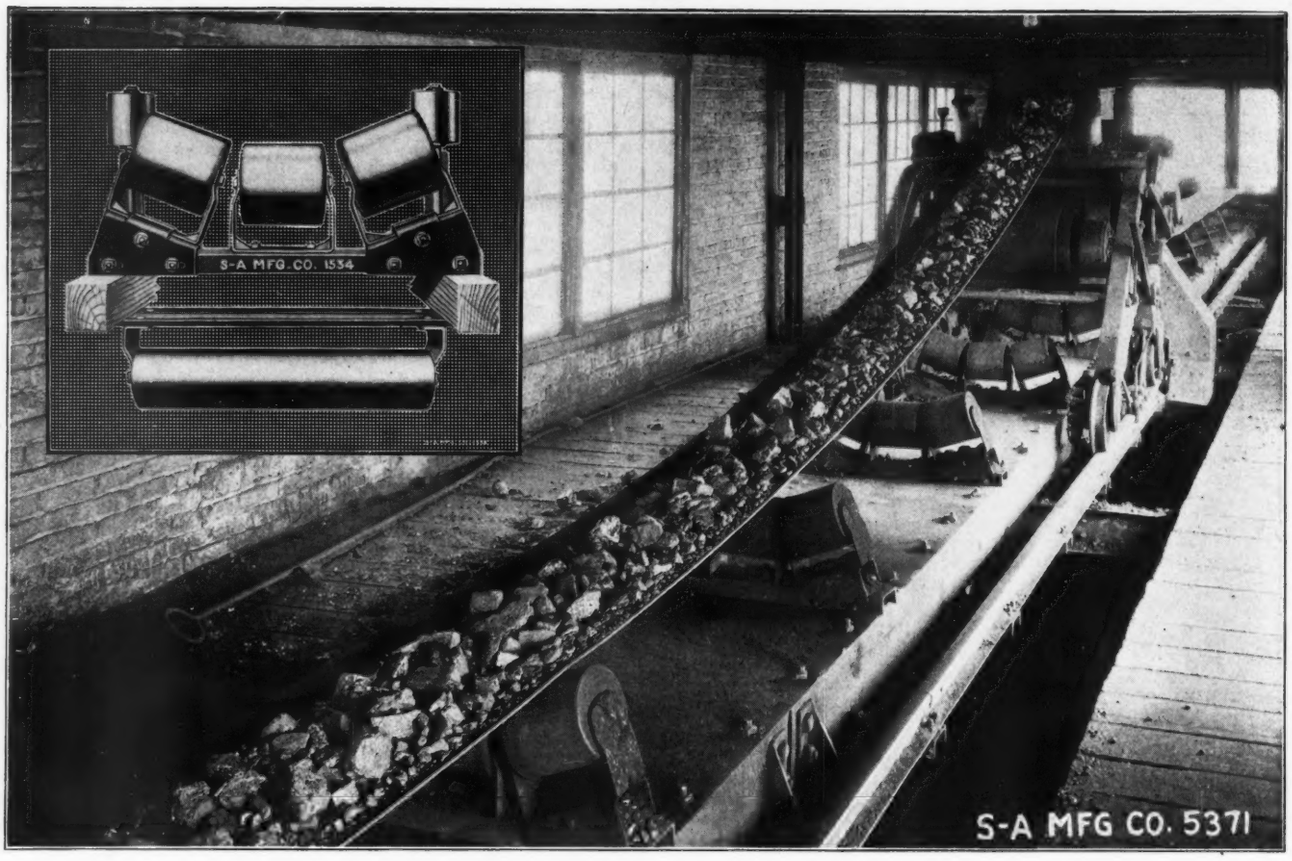
The Similkameen Silver-Gold-Copper District of British Columbia
By C. M. Campbell

Making Mining Engineers from Disabled Soldiers
By W. A. Clark

Sketch of HON. TASKER L. ODDIE, *New Senator from Nevada*



An Architectural Hoist House at the Songo Mine, Birmingham District, Alabama



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Civilization and Copper

THE BIG COPPER MINES, including some of the largest of the "porphyry coppers," have shut down because they could not foresee any trend which promised relief from existing conditions. Every analysis of the situation during the post-war period has turned out to be erroneous. It was confidently foretold by everyone that after the long famine in copper which had been undergone by central and eastern Europe, together with the rebuilding necessary in France and Belgium, and the resumption of normal industrial activity in all countries, there would be an unprecedented demand for copper, and 30c. copper was freely predicted for some time during 1921. Some of our keenest observers, successful producers of metal, great bankers, visited Europe after the war and confirmed these analyses. They reported a great lack of the metal, and, therefore, an enormous "latent demand," which would soon be transformed into a bull market. That happened over a year ago. All prognosticators were wrong. Copper has sagged in price and in demand from that day to this, and the recent closing down of the big mines was not only a sign that they had been operating at a loss, but indicated a lack of any vision of a turn for the better in the near future.

What was the compelling factor which was neglected by everyone, captains of industry and the rest? Probably this: they reckoned on the basis of the past, forgetting that the great cataclysm which had befallen Europe was unprecedented, and that the favorite analogies of the Civil War in the United States and the Franco-Prussian War in Europe really were not applicable or comparable in proportion and in purport.

Germany and Russia and other countries bought our copper before the war not because they were populous, but because they possessed a developing people, eagerly advancing in industrial and civic life. Their energies were given largely to new construction, greater public comforts, development of natural resources. In a word, it was civilization and science which bought our metal. China is populous, but it is not a great consumer of our copper: India possesses a considerable fraction of the population of the earth, but that fact does not affect our copper market. *The consumption of copper, and its price, depend, then, on the level of industrial civilization,* and on the concomitant economic and financial conditions.

The Great War struck at the heart of civilization. The catastrophe, through which we have by no means yet safely passed, set back, to all appearance, the progress of mankind enormously. Ideals of culture, of scientific progress, of universal friendship, of a breaking down of national prejudices and of economic and intellectual boundaries, were antagonized and done to death by the materialism and rude onslaught of the "Blonde Beast." The reactions of hate and violence which were awakened all over the world resulted in the miserable calamities of Russia, whose civilization has dwindled away with the most appalling swiftness.

Europe has broken up into smaller states, a turning back of the trend of history, which was plainly toward larger and larger federations of states; and the inhabitants of all Europe still think mainly in terms of war, and in a large degree have become resigned to a condition wherein they are satisfied with buying what they may wear and what they may eat, like China and India. The unattached masses in Russia have been in a turmoil of unrest and have been non-productive; and symptoms of the same disease have been marked in nearly every country of Europe, including England. We in this country have suffered from the contagion, but not dangerously. We have emerged strengthened by the test.

What of the future? And what can be done? All, we repeat, depends on the health of civilization, and the confusion of barbarism in Europe, our commercial partner. And the biggest factor in this is the United States. Had the United States been governed with superior wisdom it is altogether probable that the European catastrophe might have been prevented; as it is, the responsibility which now rests on our people and our Government is vast. Therefore, to revive business, to renew mining, the first thing we must do is to work on Europe's problems. Europe is what ails us—more than taxes or tariffs. To be puttering around about protective tariffs at this moment is to be fiddling while Rome burns.

It is Congress, however, which will put in its spare time in fiddling. Signs are not wanting that we have statesmen who see to the heart of the matter. We have such a one in Hoover, as his utterances of over a year ago testify; and we think we have such a one in Hughes. We are hopeful and optimistic over the outcome, and impatiently await the stages of action, after the disintegrating delay caused by the deadlock in the last Administration.

A Question of Policy

CERTAIN BRANCHES of the Executive Department of the National Government in Washington have adopted and gone far on a policy of some importance, which we will presently sketch out. We are not clear as to how far the propriety of this policy, as a national feature, has been investigated, how far it would be approved of by the President, how far by Congress, how far by the people at large.

The policy we refer to has, so far as our observation goes, been most actively pursued by the Bureau of Standards, which, being in the Department of Commerce, is now in Mr. Hoover's department, and in the Bureau of Mines, which belongs to us miners anyhow.

Where private corporations are found which will contribute funds toward the elucidation of a problem of scientific and economic interest, these bureaus arrange to have their own experts carry on these investigations, on funds provided fifty-fifty (or some other proportion) by the private corporation and from the public funds voted the Bureau by Congress. The results are not the exclusive property of the corporation which helps to finance the investigation: they are for the information and for the assistance of the public. These bureaus, therefore, feel that they contribute to the public service to which they are devoted, and by these thrifty strokes of business eke out the limited funds which Congress doles out to them. Of course, the corporations in question also feel that they have made a wise and thrifty deal. They do not plan it for the public good—no corporation can conscientiously contribute from its earnings to anything except what will advance its own interests—but for their own advantage.

The problem agreed upon is usually selected by the corporation, and is one the solution of which is of vital importance to its earnings. It does happen, and not infrequently, that the problem is one the solution of which will immediately benefit financially only the co-operating corporation, because of some exclusiveness of business or of control in the field which the corporation covers. In such a case the corporation gets the immediate benefit, or a running start on competition; and the public and science gets the knowledge.

This plan of business deal varies in some cases from the common type as between Bureau and corporation, in that the Bureau may and does enter into such a financial partnership with a non-Governmental or other society or similar organization, in order to promote some movement in which both are interested. What looks like a mutually profitable arrangement may be made, looking toward the common good, with an organization consisting essentially of the engineer element, or again of the employer element, or yet again of the labor element.

We have tried to outline the problem clearly. We do not know the origin of this movement. We imagine it started within the Government, where co-operation between different divisions of a bureau frequently demands a pooling from two funds assigned by Congress for two different and specific purposes; where the co-operation between different bureaus in a department often demands a similar pooling of funds and expert investigation; and where the elimination of duplication even between departments is sometimes best accomplished by similar common sense and tape-cutting methods.

It is apparently not a far step, in mental and logical processes, to proceed from these business arrangements within the Government to such an arrangement between the Government bureau and a non-Governmental technical society. In reality, however, there is a radical departure involved in this step; and a policy has been adopted which must be closely scrutinized on all sides.

From the technical society to the commercial or labor organization the change is made by easy degrees, and from that to individual corporations. The further step to the similar business partnership between bureaus and individuals has not yet been made, so far as we know, but there is no reason in the world why it should not be taken, if the other steps have been justified.

The main point at issue is: Are bureaus empowered to go into business for themselves, work on outside capital, and select their own partners, who specify the special field of this partnership? The next point would be whether, granted (which we must discover) that they are within their authority, they are wise in adopting this policy.

The Institute Transactions

THE American Institute of Mining and Metallurgical Engineers has done wisely in sending to its members a return postcard on which they may indicate which section of the current volume of *Transactions* they wish. These sections are issued really as separate volumes, and are four in number. Any member is entitled to all four if he wishes them: but if he is not interested he can save the Institute much money and himself a lot of bother by not ordering them. This plan will probably work a very considerable economy.

Systematized Shaft Work

SHAFT SINKING today is a specialized business, and the conditions under which it is done usually involve not only a considerable outlay in the matter of equipment and the employment of skilled workmen but careful planning as well. Considering the function of a shaft and its relation to subsequent operations, it is obvious that it is of the utmost importance that this first step to the opening up of an underground mine be accomplished in a manner that will fulfil all of the requirements. The shaft is, in a way, the artery of the mine, and upon its performance—we admit the possibility of an exhaustion of ore reserves, of course—depends the existence of the mine. Whether the shaft be sunk in rock, hardpan, loose ground, or quicksand, there is similarity of procedure, although each operation may involve details peculiar to the conditions met.

The concreting of shafts and the use of steel timbers are by no means new in mining, but in this particular work several innovations have been introduced, and present practice not only includes adequate facilities for handling material at the bottom and in the shaft but on the surface as well. There must be, if the job is to be efficiently done, a complete cycle of work wherein each operation follows the other in regular order. There will be, of course, unforeseen interruptions that necessitate special treatment, but such delays can usually be compensated by a gain in progress under ordinary conditions.

In his article, "Sinking and Concreting of Pyne and Songo Shafts," which appears in this issue, J. H. Stovel has brought out several points that merit the attention of those who are engaged in (we say this with temerity in these perilous times) or contemplate (this with optimism) shaft sinking. The use of drill holes for eliminating pumping in this connection is not, we believe, general practice, but the plan was successful in the operation described, and at one of the shafts the drill hole was used in grouting to good advantage.

The use of different types of drills in different rock strata seems quite obviously good practice, although we know of instances where the same machines were used throughout an entire job. The proper care of machines is another example of good practice and one which the drill-machine manufacturer is continually recommending, although it may militate somewhat against sales.

It is interesting to note that lower costs for concreting were obtained at the Songo shaft, where the pipe method of distribution of the concrete was used, in contrast to lowering it with a bucket, as practiced at the

Pyne shaft. This would seem to be an argument for a proper crushing and screening of the slag used in the concrete mixture. In general, the results obtained in the different operations at both jobs indicate the success that may be had by following a well-systematized plan, which is true in any branch of mining as in other industries.

Theology Applied to Mining

MINING MEN are not much given to discussion of theology. Their business does not tend in the direction of the heavens; so such snatches of remarks as miners let drop quite naturally are likely to be flavored rather with allusions to the lower regions. They deal and traffic, indeed, with the product of the infernal flames—ores built by the fires that are not yet extinguished, as many a hot spring testifies.

As to the supernatural, however, many of us have become bald and literal. While we may refer flippantly in conversation to spiritual manifestations, we have long ago forsaken the belief in the personal devil and in the guardian angel. We assume, fishy-eyed, that we walk alone. Yet it is not beyond the realm of comprehension that science, still further advanced, may lead us, astonished, back to where we started from.

Have you not perchance a personal devil? Oh, no; not a conventional one, with horns and tail, and transparently blue. For one thing, such a familiar spirit would be ineffective and, therefore, not practical: you and I are all altogether too wise and too well-intentioned to listen to such an adviser. If we should once see such a one, we would have no more of him. But do you know a man—or a woman—a very well-appearing individual indeed, whom you rather admire, who has the faculty of dropping in for a chat with you, and leaving you vaguely dissatisfied, with a tinge of jealousy or rancor, or with the recrudescence of the bitterness of unworthy ambition, or with the uneasy awakening of a long-slumbering greed? Have you not recognized your personal devil—it is he, this debonair and self-satisfied but more or less meddlesome and insinuating friend! Watch that fellow—some day you'll catch the suspicion of a blue flicker around the chair he has just vacated, or detect the faint brimstone odor in his cigarette.

Or, you run across some chap now and then who shames you a bit (although you do not know it) with his honesty and independence. He does not at all resemble the angels—has no wings nor lustrous hair—it is barely possible, even, that he chews tobacco—it is almost a cinch that he has never been to college; but when he has passed the time of day with you or made some comment of homely philosophy on the world, you go off amused and smiling, with a truer enjoyment of the sunshine and your job. He envies nobody—no, not he—and nobody envies him. He is neither wasting his daylight hating the rich nor in despising the low-down and unfortunate. You would hardly be expected to recognize your guardian angel—and yet, think again, dear sir—was it not perhaps he?

The Works Chemist

ROUTINE LABORATORY WORK is one of the bugbears of the practice of chemistry. Too often the graduate in chemistry or chemical engineering accepts a laboratory position in which he has the same analyses to make, on the same kind of material, hundreds of times a week. He is likely soon to become discouraged. Of course, in the first week or two he learns a great deal. In school he has taken plenty of time, and a high degree of accuracy has been demanded. In practice he must make twenty assays in one-twentieth of the time he had formerly taken.

Also, he learns that a report of 34.63 per cent of silica in a slag is ridiculous. The sampling is nothing like as accurate as that; neither is the analytical method he is taught to use. So he learns to grind out the assays, dozens of them a day, and becomes oftentimes a mere automaton, equally proficient asleep or awake, and getting deeper and deeper into a rut. Sometime he may come to be chief chemist, in which case he may do only the most important routine work, and spend the rest of his time in bookkeeping. Of course the picture is not as discouraging as this at all plants: at Anaconda, for example, the laboratory is only a stage in the promotion of technical graduates through various works activities. However, it is true in many cases, and it is a condition of affairs which managers may well seek to obviate, both for the good of the "assay office" and the plant as a whole.

Too many managers and superintendents forget they have a laboratory: at least they do not use it to the best advantage. The chemist should be given a freer rein, and his interest aroused by a variety of analytical and research work. The laboratory should be in close co-operation with the purchasing department. Not only will the chemist be a happier employee, but the company will save money. One of the members of the Institution of Mining and Metallurgy, B. W. Holman, voiced this idea at a recent meeting in London. A great many mining and metallurgical supplies should be tested and analyzed and bought under specification. Among them may be mentioned:

Drill steel: What analyses give best results?

Rubber: How much filler and remade rubber do you buy because you make no analyses? Could you even give intelligent consideration to an analysis if made? The chemist can help you if you let him do a little testing.

Lubricating oils and greases: A fertile field for misrepresentation.

Cement: How do you know that the brand which you use is the best for the money, for your purpose? Granted it was the best when made, is it the best now?

Lime: You cyanide men, how much available CaO do you get for a dollar? Your chemist can tell you quickly.

Paint: A chemical engineer knows something about paint. Do you ask him or the paint salesman?

Coal and coke: Do you buy on the basis of analysis or heating value, or does the seller palm off on you his extra wet and high-ash cars?

Candles, carbide, cyanide, chloride of lime: Here are a few more of the C's whose strength and condition should be checked.

It may be argued that the ordinary works chemist has not the knowledge or equipment to test miscellaneous supplies. However, elaborate tests are not usually needed. By far the majority of the work which should be done can be conducted by the usual type of technically trained chemist, aided by a little outside reading. Any extra equipment need will quickly be paid for by the savings made.

We hope that every chemist who reads this will ask himself if he is making full use of his ability; and that every plant manager will also question himself whether he is making full use of his chemical laboratory.

WHAT OTHERS THINK

Price vs. Analysis as a Basis For Buying Steel

I have noted with interest E. A. Wright's paper on the standardization of mining equipment, read before the Institution of Mining and Metallurgy and mentioned in the *Engineering and Mining Journal* of Feb. 12. Years of experience in buying and selling iron and steel products for the mining field have convinced me that Mr. Wright is correct and that it is high time for the managers and purchasing agents to get together and do something that will insure their getting uniform material that is adapted to the work to be done.

Mr. Wright states that one manufacturer refused to give him information. I think that the time is not far distant when manufacturers will be glad to get business by giving all possible information regarding the materials used in their products. This can be brought about by some progressive manufacturer soliciting business on this basis.

It has been pretty well demonstrated that balls for ball mills give best results when the chrome content is about 0.5 per cent or a trifle less, and the carbon about 0.65 or 0.85 per cent. The addition of about 3 per cent of nickel makes a ball of still longer life. These balls, of alloy steel, are good through to the center. The little forging done to a ball may do the outside some good, but the effect of forging does not persist to any appreciable depth, and after the ball has worn down a quarter of an inch or so, the life of the ball then depends on the alloys, including carbon. The same thing applies to a great extent to shoes, dies, and like parts.

There is a story, probably true, that a mining company in South America ordered a carload of shoes and dies, simply stating that they were to be of ———— steel. These were ordered from a reputable machinery company, which, in turn, ordered them from a manufacturer of steel. The shoes and dies eventually arrived at the mine after paying heavy freight, and when put in operation were like so much cheese. Naturally the mill owner howled, and the howl was passed through the machinery house to the steel manufacturer, who calmly said: "You are in error; some one has substituted; that material is not ours." This manufacturer had not marked his product, and the purchaser had no recourse.

Another instance: A mining company in Central America bought a ———— steel lining for a ball mill. After great expense the lining arrived, and lasted about as long as the cast-iron linings that were made by the mines foundry. The purchaser was disgruntled, but it did him no good.

A short time ago a purchasing agent bought for shipment out of this country about twenty-five tons of steel shoes and dies on a price basis without regard to analysis. He thinks he has saved money: maybe; maybe not. I would bet on the not.

About five years ago I got in touch with a small steel manufacturer, told him of the conditions existing, and obtained his co-operation in order to get some good steel. We got all the data we could, worked out a formula that we thought would pass, and the results proved very satisfactory. For three or four years I bought steel from this man, and it was all bought on analysis. The results were highly satisfactory. No more complaints were received about abnormal wear. All concerned were satisfied, and I thought that a good piece of business had been done. Whether or not this man supplied others with the same steel I received, I do not know. If he did not, he was foolish, as he had a good opportunity.

If I were selling steel today I would educate the managers, engineers and purchasing agents until they knew what good steel was, taking pains to furnish them with information concerning the best steels for different purposes. I would advertise my steel, giving the analysis, so that when my salesmen were out in the field and the question of price was raised they could point to the product and defy competitors to show their hands.

All steel manufacturers can purchase raw material at market prices. They are all on an even basis in this respect. The manufacture of steel is then a matter of ability, and desire for profit. If one manufacturer can take the same raw materials and make a better product than another, that is ability. His margin of profit is probably larger than that of the inefficient manufacturer, who, to obtain business, will reduce prices and furnish inferior material, refusing to give the purchaser full information about his product and hiding behind the phrase "trade secrets," of which he does not have any. If he did he would use them and make better steel.

It is up to the steel manufacturers to do the educational work, and the time to start is now.

New York, N. Y. E. W. LAWLER.

Domestic Copper for Domestic Uses

In recent numbers of *Engineering and Mining Journal* I have noted two statements relating to the copper industry which, it seems to me, are highly significant. One statement has appeared in the editorial columns, the other among reports of operations of companies. The first statement is to the effect that the prices of finished copper products are unreasonable, giving consumers the impression that articles of copper are luxuries out of reach of the average purchaser. Anyone who has seen direct comparative prices of iron and copper articles will certainly agree that this is so.

The second item states that the Anaconda Copper Mining Co. is now shipping a large portion of the product of its mines to its rod and wire plant, which is finding a market for the goods in the West.

Why is not this the solution of the domestic copper problem? Let the producers form their own manufacturing companies, produce the finished goods, and sell them to the public at a fair profit to themselves and an immense profit to the industry as a whole! Imagine a home with a shining row of copper cooking utensils in the kitchen, bought at a price perhaps only slightly above prevailing prices for granite and aluminum ware.

Multiply that home a few million times and the total runs into *tonnage*. Do the same with screen, tubing, sheet-metal products, builders' hardware, and the like, and the recent success of the Monel Metal distributors in creating a market would be outdone by a wide margin.

Give the American public a taste of copper goods at a reasonable price and they will want *more*. Isn't it up to the producers? H. M. KING.

Clifton, Ariz.

Low-Grade Cyanide

In the opening paragraph of my paper (to Inst. Min. & Met. See Vol. 6, p. 2) on "Sump Solutions," etc., occurs the sentence: "It is obvious that, unless these constituents are prevented from accumulating in the solutions, the solvent power on the precious metals of any added cyanide must sooner or later be impaired." We cannot afford to forget these first principles.

Mr. Kirchen, in his letter in your issue of Feb. 19, gives further results from his use of low-grade cyanide and states that he does so in response to my suggestion. I am grateful for all responses to my repeated requests for data, but I am unable fully to comprehend or indorse Mr. Kirchen's remarks. I invited him to give his experience on at least a year's run. He replied with a statement as to the value of a product for metallurgical work being determined solely by the amount of NaCN contained. This is contrary to experience. He contrasts his result of eleven months' run with a set of figures for high-grade cyanide materially differing from those given by him in your journal of Sept. 25, 1920, in which the consumption of NaCN per ounce of bullion is 0.142-lb. for high-grade cyanide, as against 0.160 lb. for low-grade.

In your issue of Dec. 4, p. 1098, you referred to the resumption of the use of high-grade cyanide at the Hollinger and Dome mines. But it is to the interest of the industry that attempts such as those of Mr. Kirchen to use low-grade cyanide should, if possible, receive encouragement. The freer the cyanide market, the greater the quantity of profitable ore. The cyanide industry was built up on the use of cyanide which would now be considered low grade. High-grade cyanide, it is true, has eventually won its way into preeminence, but the encouragement afforded by users of low-grade cyanide to new methods and processes incites improvement in quality. ALFRED JAMES.

London, S. W. 1.

Voodooism Applied to Mining

From time to time in *Engineering and Mining Journal* I have read with great interest articles on the invention of the so-called "wiggle stick." My experience with the people using this invention came about in a number of ways. While in charge of detail work in a Kansas field in the summer of 1916 I was by chance residing with an oil operator at Paolo, Kan. This gentleman had seen a number of my maps and inquired as to the nature of our work, but little information could be obtained from us. He stated to me one day that he had an instrument with which he could locate oil, and I decided that this was an opportunity to learn something—something new in the location of structures. This instrument consisted of a piece of clothes-line wire made in the form of a U and held in the hands, and as he would walk over the ground, when the desired oil structure was located, it would gradually bend down toward the center of the earth. He also stated that he had obtained this invention from a negro who owned the adjoining lease. I tried to use the instrument and had no success.

While at Ranger, Tex., I met another gentleman who claimed to have such an instrument for locating oil, which would do various things. This instrument consists of a tin funnel lined with copper, inside of which are small grooves for placing different vials of liquid. From the center was a wire making an apex about four inches from the top, from which a small wire plumb bob was placed. This man was a carpenter and knew nothing of geology, but afterward I learned that one of his clients had spent some $400,000 following this "wiggle stick."

In the sensational case of late of bankruptcy in the S. E. J. Cox and the General Oil Co., a few statements were brought out in reference to an instrument used by Dr. Griffith, of Houston, in locating oil structures. The president of the Humble company stated that Dr. Griffith had made two locations for them in the Humble field, and they decided to drill in the center. They struck oil. Dr. Griffith claimed that they drilled a crooked hole. The instrument he used is a silver tube which has handles on the side. It is claimed for this instrument that Dr. Griffith can locate water sand, oil sand, and gas sand, and can tell the different formations thousands of feet below the surface.

A friend of mine stated that he had switched the vials used and the instrument worked just the same.

The public who pay for the use of such intruments only have to go into the office of the large operating companies and see the nature of their routine and labors in working out the different structures to find that the geologist who gives the best of opinions does not use any of the instruments mentioned. I will admit that the Gulf Coast fields with a salt dome present a very complicated problem. FRED. F. YOCKSTICK.

Humble, Tex.

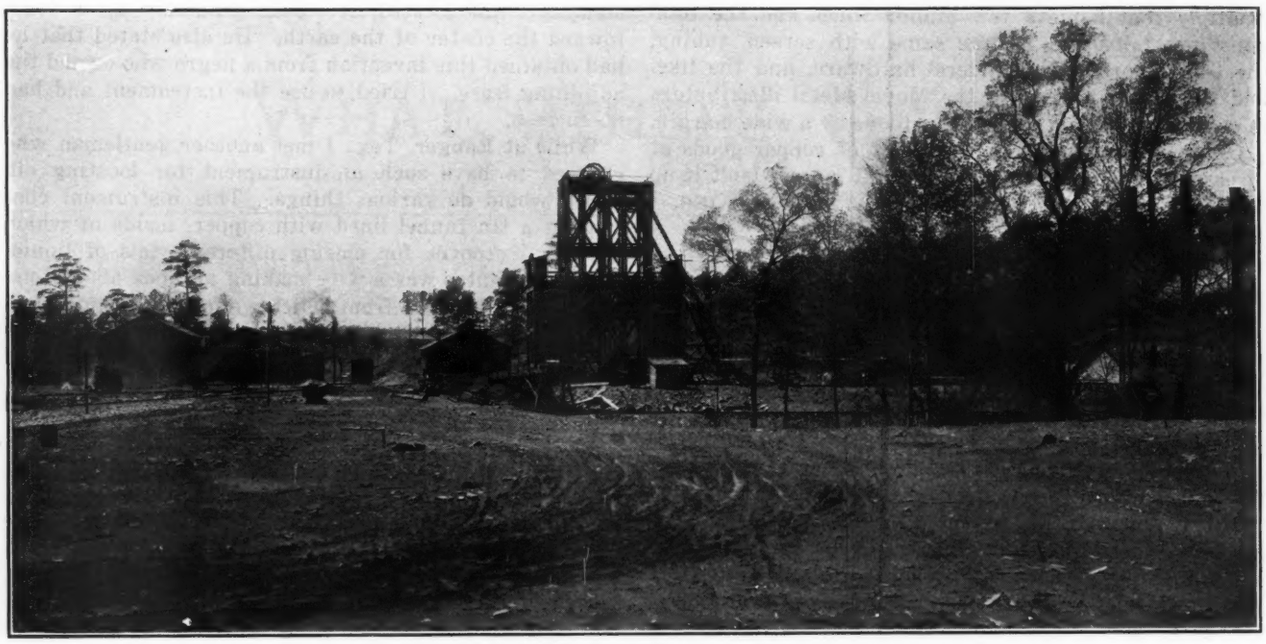
Standardization of Stamp Shoes

We have noticed with a great deal of interest from time to time articles in *Engineering and Mining Journal* in regard to standardization of mining equipment. Mining companies operating stamp mills could easily and at a small expense standardize on stamp shoes. We have found that there are innumerable sizes of stamp shoes, though there really should not be more than four or five sizes. The principal differences in dimensions on shoes are in the neck or stem. These differences are only slight and immaterial, and the only thing necessary to meet a standard dimension would be to change the shape of the hole in the boss head on the shoe end. This could be done the first time that new boss heads were purchased, and there would be no additional cost to the mining men for this change.

The standard stamp shoe would work to the decided advantage of Pacific Coast mines, inasmuch as it would be practicable for manufacturers or supply houses to bring these shoes to the Pacific Coast via water through the Panama Canal in carload lots, and thus greatly reduce freight rates.

We believe that the stamp-mill operators should look into this matter and consider the advisability of adopting standards. HICKOK AND HICKOK,

San Francisco, Cal. G. F. Hickok.



PYNE SHAFT OF THE WOODWARD IRON CO., WOODWARD, ALA.

Sinking and Concreting of Pyne and Songo Shafts

Operations at Two Properties in the Birmingham District Which Involved Somewhat Similar Problems, Although Different Methods Were Used in the Lowering and Delivery of Concrete to the Forms—General Costs and Progress

BY J. H. STOVEL*
Written for *Engineering and Mining Journal*

THE PYNE SHAFT of the Woodward Iron Co., of Woodward, Ala., situated in Shades Valley, about three and one-half miles south of Bessemer, was the first vertical shaft of any considerable depth sunk for iron ore in the Birmingham district. The foot wall of the ore bed was 1,214 ft. below the collar of the shaft, which was lined with steel timbers and concrete throughout. The Songo shaft, also of the Woodward Iron Co., was sunk vertically to connect with the Songo slope at a considerable distance from the mouth of the slope. This shaft also had steel timbers and concrete lining. The sinking and the concreting of these shafts were done under contract by the E. J. Longyear Co., of Minneapolis, Minn.

BOLTED STEEL TIMBERING IN SHAFT

The Pyne shaft is rectangular in section, 13 ft. 1 in. x 21 ft. 1 in. outside dimensions, and has six compartments—two skipways, two cageways, one ladderway, and one pipeway. The steel sets were placed at 6-ft. centers, 6-in. H-beams, 23.5 lb. to the foot, being used for wall plates, end plates, and dividers, and 3-in. x 4-in. angles being used to connect the sets. The different members of the set were bolted together in the shaft. Twelve-inch I-beams were used for bearers and were put in at about 100-ft. intervals, but in one instance, owing to soft caving ground, 180 ft. separated two bearer sets. The end plates and wall plates were set with the flanges in the vertical plane, and the shaft was lagged, as shown in Fig. 1, with 2-in. planks.

During the construction of the concrete collar and of the headframe, a 3-in. diamond-drill hole was sunk 400 ft. in the center of the shaft section, and this hole discharged a full bore of water under a small head. To grout the water-bearing area, 1,006 sacks of cement, mixed with water in as thick a mixture as a Cameron pump would handle, were pumped down the hole in twelve hours without the pressure gages at the pumps showing any perceptible rise in the pressure. Not more than twenty gallons per minute was handled from the shaft at any time, so it is evident that the grouting stopped considerable water.

Ingersoll-Rand, B. C. R. No. 430 Jackhamers were used for the shale and sandstone formations, which comprised 80 per cent of the measures sunk through, and the Denver Rock Drill No. 60 demounted "Dreadnaught" drills were used in the harder chert formations. The hose-header, comprised of a 3-ft. length of 4-in. pipe, bored and tapped for ¾-in. hose connections, was connected to the air line by a 3-in. air hose and always hung within convenient reach of the men drilling. The ¾-in. drill hoses were always left attached to the header, and when drilling was finished the 3-in. air hose was disconnected from the air line, and the header, with all the hose attached, was hoisted to the surface. After each round, all the drills were sent to the shop for oiling and repairing. Drill repairs cost $1.14 per foot of shaft, a considerable portion of this being due to the use of the Jackhamers on the hard chert formations before the larger drills were available.

Timbering was done from a stage, containing trap

*Mining superintendent, E. J. Longyear Co.

doors for each hoisting compartment, which was hung, by means of steel cables, from the last set placed. The shaft crew worked with the timberman during the placing, lining, and lagging of the set, this work being done usually in a little under two hours. The shaft crew then resumed work on the bottom, and the guides, ladders, and other complementary construction were completed by the timbermen, the trap doors of the stage, under the compartment in which they were working, always being closed.

The number of holes drilled per round varied from twenty-four to forty-two, the wide range being due to the different nature of the formations encountered. A V-cut along the longer axis of the shaft was used, and this was blasted and partly mucked before the benches were blasted. Du Pont 40 per cent gelatin powder was used, and this was detonated by instantaneous and first- and second-delay electric exploders. A 220-v., d.c. circuit was used to fire the holes, and the usual safety precautions were taken in connection with the firing switch. Cost of explosives, including exploders, lead wire, and connecting wire, were $8.60 per foot of shaft.

The surface equipment consisted of three 125-hp. boilers, equipped with grates for burning coke braize; two 1,000-cu.ft. air compressors, three hoists, a 15-kw. steam-driven generator, and a well-equipped blacksmith and machine shop, in which place all the steel for the shaft was fabricated. Two out of the three hoists were always available for mucking, and the third one was used by the timbermen, pumpmen, and other employees. The buckets used would hold a one-ton net load.

Ten miners were employed, on an average, on each shift, the time distribution over the entire shaft being as follows: Drilling, 16.8 per cent; blasting, 5.3 per cent; blowing smoke, 5.9 per cent; mucking, 43 per cent; timbering, 25.3 per cent, and delays, 3.7 per cent. The average drilling per machine per hour was 5.3 ft. and the average mucking per man per hour was 0.89 tons. Sinking from the headframe was started on Aug. 11, 1918, and the ore was struck at a depth of 1,214 ft. on May 13, 1919. The highest progress in any one month was 180 ft. and the lowest was 100 ft.

Preliminary Preparations for Concrete Work Elaborate

Some of the formations passed through in the shaft showed need of support other than the shaft timbers, and it was decided to line the entire shaft, ore pocket, and station with concrete. The quantity involved, between four and five thousand yards of concrete, was sufficient to justify considerable preliminary expense on equipment for handling concrete materials. The installing of this equipment and the general preparation work for the concreting operations were carried on during the time the pocket was being excavated.

A trestle, sufficiently strong to support a railway locomotive, was built as close to the shaft as the headframe brace legs would permit. The approach to this trestle was about 500 ft. long, with approximately a 2½ per cent grade, and the end of the trestle nearest the headframe was level for the last 120 ft. Two double hopper-bottomed bins, each of two-railway-car capacity, were so built under the trestle that a minimum tram could be obtained to the mixer. Tracks were laid to the chute doors under these bins, and small end-dump cars, of a size holding the exact amount of sand or slag needed for the mix, were used to tram these materials from the bins to the hopper of the mixer. The concrete mixer was placed opposite the ladderway of the shaft, its loading hopper being depressed in a pit below the level of the tramming tracks, which permitted the tram cars to be dumped directly into this hopper. A small shed, capable of holding from 200 to 300 sacks of cement, was built on one side of the mixer hopper, and the cement handler, working in this shed, dumped the necessary amount of cement directly into the hopper. About fifty feet away, and on the spur track of the mine, a cement storage house, of two-car capacity, was built. Cement was trammed, either from this storage house or from the cars, to the cement shed.

Concrete Lowered in Sinking Buckets

As the coarse aggregate furnished was unscreened slag, dug from a slag pile by a steam shovel, it naturally contained a quantity of larger material than could be handled. Much of this was eliminated by the trammers and some by a bar grizzly, with 3-in. openings, placed under the discharge of the mixer. Even then

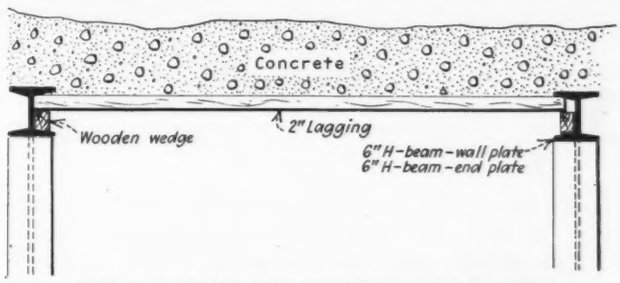


FIG. 1. LINING AND TIMBERING IN SHAFT

too much coarse material was left to permit of dropping this through any pipe of reasonable size without fear of blocking the pipe. This necessitated lowering the concrete in the buckets which had been used for sinking, these being 40 in. in diameter, 39 in. high, and having a flat bottom. An 8-in. x 8-in. hole was cut in the bottom of the bucket, and a discharge gate riveted on the bucket around this hole, the inside of the bucket being hoppered, funnel shape, to assist in the discharge of the concrete. The mixer discharged over the grizzly into a pipe leading through the concrete collar to a bin capable of holding a little more than one mix. This bin was built in the ladderway of the shaft and had a discharge gate on it similar to the ones used on the buckets. A stage was built below it, and from this stage one man could direct the concrete to any one of the three buckets used.

The lowering of the concrete in buckets involved considerable strain on the hoist brakes, and these were equipped with asbestos brake blocks. These blocks were practically worn out at the completion of the job, but it is safe to say that ordinary wooden blocks would not have lasted a single shift. Fig. 2 shows the layout of the surface arrangements and also the three compartments of the shaft through which the concrete was lowered in buckets.

Wet Timbers Make Tight Joints Difficult

The timbering in the station and ore pocket was also made up of 6-in. H-beams, of the same section as used in the shaft, with the exception of the roof members in the station, which were 12-in. I-beams. As shown in Fig. 1, the inside of the concrete lining of the shaft was practically flush with the outside of the steel timbers used, but in the pocket and station the

concrete lining was flush with the inside of the steel timbers. By boring the necessary holes in the flanges of the timbers before they were put in place, it was a simple matter later on to place the concrete forms as shown in Fig. 3. In the roof of the station and in the hanging wall of the pocket 3-in. plank was used for forms, and 2-in. plank was used for the remainder of the work. In the shaft, the 2-in. plank which was used for lagging while sinking was also used as forms for the concrete.

The forms for the pocket and station were put in as the work progressed, and it was a simple matter to make the joint tight. Most of the lagging in the

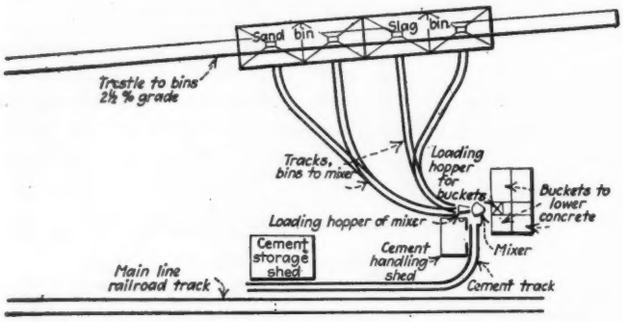


FIG. 2. SURFACE ARRANGEMENT FOR HANDLING CONCRETE MATERIALS, PYNE SHAFT

shaft, which had become water soaked, had to be taken out, to clean out behind it before pouring concrete, and in putting back this wet plank it was found difficult to make tight joints. A great deal of care was taken in caulking the joints, but, despite this, considerable sludge escaped to the bottom of the shaft, where it remained in a semi-liquid condition and afterward proved difficult to muck out.

Slowest Progress Made Below Station

The cage compartments did not extend below the station, and, consequently, only two buckets could be used to lower concrete below that point. The maximum hoist was also at this point, so that the slowest progress, in yards of concrete placed per day, was made on the work done below the station. This part of the concreting was also complicated by the placing of heavy castings in the bottom of the pocket. By taking advantage of the height possible in the shaft, all the concrete placed in the pocket flowed directly from the bucket into place without extra handling. Eliminating the first day, on which only a short test run was made, concrete was poured on twenty days in October, and a total of 800 cu.yd., or 40 yd. per day, was placed in the shaft and ore pocket below the 1,214-ft. station. This practically completed the work below the station. During November, 1919, the average pour per day was 52 cu.yd., it being possible to work three buckets above the level. In December, concrete was poured twenty-one days for an average of 55 yd. per day. In January, 1920, the actual shaft concreting was completed, concrete being poured for nineteen days at an average daily rate of 66 yd. per day. The increase in yardage poured per day was due partly to the decreasing distance the concrete had to be lowered and partly to the increasing expertness of the crew in its various duties. At the outset of the work the mixer was waiting for the buckets, but the opposite condition prevailed toward the finish. The mixer was steam-driven and the batch mixed in it was two-fifths of a cubic yard.

In the concreting of the ore pocket, such stages as were needed for the men to work on were built as the work progressed. In the shaft, a stage, built with runners so that it would travel freely up and down on the guides, was provided for each compartment. These could be attached, for moving, to the buckets by means of cables with long hooks on their free ends. They were also so arranged that they could be detached from the buckets and be left resting securely on any set of timbers. The stage in the compartment for which there was no hoist was moved by means of a rope from the bucket in the compartment next to it. These stages, of course, were used by the men only when they were resting on the timbers and were not intended for travel.

Two Shifts Follow Regular Program

The cycle of operations in the concreting of the shaft was as follows: The night shift, comprising a foreman and four shaft miners, would work on the stages and take out such lagging as was necessary to clean out behind the lagging. Except for about 180 ft. of loose caving ground, there was not a great deal of rock to handle. The planks taken out were put back in place without wedging, and the set next above was then cleaned out, and so on. Excepting for the bad ground referred to, this crew would clean up from three to five sets per shift. Just before going off shift, the men would move their stages down and plank up the set next above the one in which the last concrete had been poured, and would caulk it up in shape for pouring concrete.

The day shift comprised a foreman, a shaft linesman, one shaft miner, and four other men, who ranked as helpers. The linesman kept lines down the corners of the shaft and watched to see that the alignment of the shaft did not shift. The shaftman watched the lagging for leaks and caulked them when they appeared, while the other four men saw to the discharge of the buckets, the tamping of the concrete into place, and other minor details of the work. As soon as this crew went down in the morning, those comprising it took out planks in

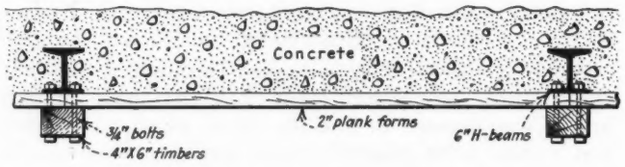


FIG. 3. TIMBERING IN STATION AND ORE POCKET

the set next above the one which the night shift had prepared for concreting, making two openings for the discharge of each bucket, these six openings being equally spaced around the shaft.

When a bucket reached the point of delivery, two men attached a heavy trough, by means of small chains, to hooks placed on the sides of the discharge gate of the bucket, the other end of the trough being placed in one of the openings in the lagging. A third man always worked at the top of the bucket to assist in its discharge if, as frequently happened, the coarse slag choked the discharge opening. As soon as the space behind a set had been filled with concrete, all of the crew worked at planking up the holes through which they had been pouring and then caulked the obvious leaks before they hoisted their stages and started pouring concrete again. The normal run was from two to

three sets per day, the highest run being five sets, or 30 ft. of shaft.

The mix used was 1 : 2¼ : 5 of cement, sand, and slag. When coarse slag predominated, the slag was cut down and the sand increased, to get a mixture that would flow. There is always a decided tendency of the coarse slag to build up at the point of delivery; and where, as in these operations, it is almost impossible to tamp the concrete, unscreened slag is unsuited for the work. While working at the lower depths the concrete showed a decided settlement in the time it was being lowered in the bucket, which was probably due largely to the vibrations of the bucket. When the bucket reached the bottom there would be a half-inch film of water on top of the concrete, and the concrete in the bottom of the bucket would be fairly stiff and would not discharge freely. As the work progressed upward, this mechanical settling became less and less, and from the 600-ft. depth up no further trouble from this source was experienced. In the pocket and station considerable reinforcing was placed in the concrete, but no reinforcing was used in the shaft section.

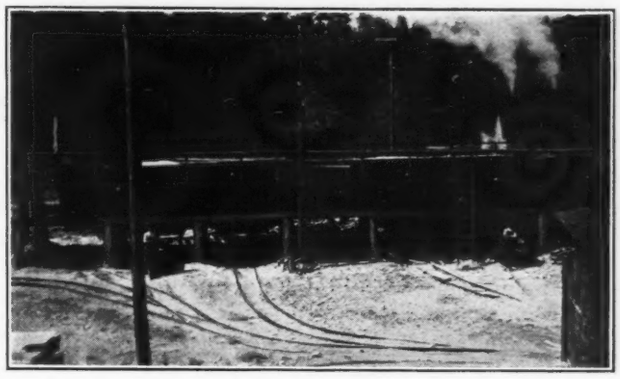
Irregular Deliveries Cause Handicaps

The surface arrangements worked out satisfactorily, except that, owing to transportation conditions, deliveries of materials were spasmodic, and at times both sand and slag had to be dumped beneath the open parts of the trestle to release the railroad cars. This material had to be shoveled into tram cars later, which entailed extra expense. The normal day-shift surface crew was as follows: One foreman, one mixer operator, one bucket loader, one cement handler, one cement trammer, four sand and slag trammers, three hoistmen, one compressor-man, and one fireman and ashman. The tramming crew was increased when it was necessary to shovel up the sand and slag which had been dumped under the trestle. A night crew had to be kept in the engine room and boiler house, as the pumping was done on that shift. The superintendent in charge, as well as the Woodward Iron Co.'s bookkeeper and that company's warehouseman, were charged directly to the concreting. The cost of the concreting included all concreting charges, as well as power, and labor for pumping and hoisting. The actual costs, not including contractors' compensation, were $14.01 per cu.yd. of concrete placed, the labor costs being 48 per cent of this total.

Songo Slope Worked Without Interfering With Concreting

The Songo shaft is 10 ft. 4 in. x 7 ft. outside dimensions, 384 ft. deep, and provided with the same style of timbering as that used in the Pyne shaft. As this shaft connected with old mine workings, a 6-in. churn-drill hole was sunk through the center of the shaft section to eliminate pumping. Where the shaft penetrated the old workings one side of the shaft was parallel to and abutted one side of the operating slope. This slope, at the time the work was being carried on, was being operated two shifts daily, and the station at the slope, as well as the ore pocket which lay directly under the slope, had to be excavated without interfering with operations. This fact necessarily slowed up the work, but the excavation and the subsequent concreting were carried on without appreciable interference with the slope.

As this shaft was comparatively shallow, and as the pocket and station were not large, the yardage of concrete to be placed did not justify much preliminary expense. Sand and slag were dumped on a track, which passed about twelve feet from the shaft collar, and were shoveled into cars and trammed to the mixer hopper. The cement was wheeled to the mixer from a small shed near the track. In this case, slag, which had been passed through a 1¼-in. round mesh screen, was furnished, and the concrete was dropped through a 4-in. pipe into place. This pipe was put together with flanges, no gaskets being used. At the bottom of the last regular length of this pipe, a 4-ft. length of the same pipe projected into a 5-in., 45-deg. Y-fitting, and was so connected that the Y-fitting could be turned in any direction. The bottom of the Y-fitting was plugged, and the concrete discharged through the 45-deg. branch opening. From this opening, the concrete was conveyed into place by sectional spouting, similar to the kind commonly used in wheat elevators. Each 2-ft. section of this spouting was connected to the next section above by light chains, and any number of sections could be readily disconnected, as the work required. This spouting was made up as required,



SLAG AND SAND BINS USED IN CONCRETING PYNE SHAFT

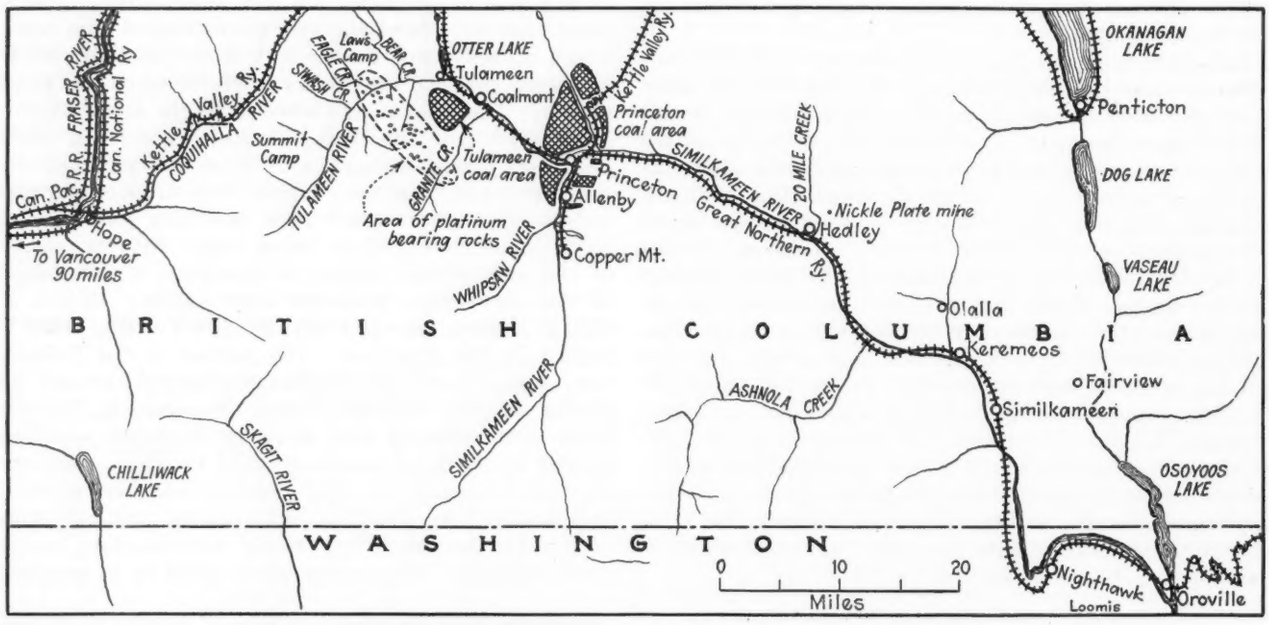
of 18-gage sheet iron, and, despite the rough usage it received in the shaft, was fit for further service after handling upward of 1,200 yd. of concrete.

Pipe Delivery of Concrete Secures Lower Costs

The advantages of lowering in a pipe instead of by bucket are fairly obvious. Concrete could be poured as fast as the mixer could mix it. Careful observation failed to note any segregation, the concrete discharging from the spouting apparently in the same proportions as it left the mixer. Considering the entire work, the time lost by blocking of the pipe was a negligible factor. The same mixture was used as at the Pyne shaft, but the use of the screened slag made the mixture flow more freely, and there was no building up of the slag at the point of delivery.

The concrete, when stripped, showed an even surface throughout. The resulting costs in the shaft, where the work was not complicated by interference of the operating slope, were approximately $3 per cu.yd. lower than at the Pyne shaft. This does not apply to the upper 80 ft. of the shaft, as this had been sunk through clay, and the cost of preparing a set for concrete was greater than the cost of concreting.

Captain James Davey, of Negaunee, Mich., was in charge of the sinking and excavation work at both shafts, and F. O. Carter, of Marquette, Mich., directed the concreting operations.



MAP OF SIMILKAMEEN DISTRICT, IN EASTERN BRITISH COLUMBIA

The Similkameen District of British Columbia

Mineral Resources Matched by Potential Agricultural Wealth—Water Supply Inexhaustible—Gold, Copper, Silver, and Coal in Commercial Deposits—Hedley Gold and Canada Copper Principal Properties—Platinum and Microscopic Diamonds Known To Exist

BY C. M. CAMPBELL
Written for *Engineering and Mining Journal*

THE SIMILKAMEEN RIVER rises in British Columbia near the International Boundary at a point 120 miles east of Vancouver. It flows directly north to Princeton, where it is joined by the waters of the Tulameen River, and then flows southeast, entering the Okanagan River at Oroville, Wash. The district drained by it has been an important prospecting area for years. From the early 60's until recently it produced considerable placer gold and platinum. The Nickel Plate mine, at Hedley, was for many years, until the development of the properties in northern Ontario, the leading gold mine in Canada, and recently the Canada Copper property, near Princeton, appeared in the shipping list. This district also contains, at Princeton and Coalmont, two small but valuable coal basins. The timber resources are considerable, and eventually its fruit and ranching lands alone will attract and support a considerable population.

The area is served by the Great Northern Ry., which runs from Princeton to Oroville and then on to Spokane by the Kettle Valley Ry., operated by the Canadian Pacific, with a through train to Vancouver. A good auto road connects all the principal points, and trails through the hills at different places are numerous.

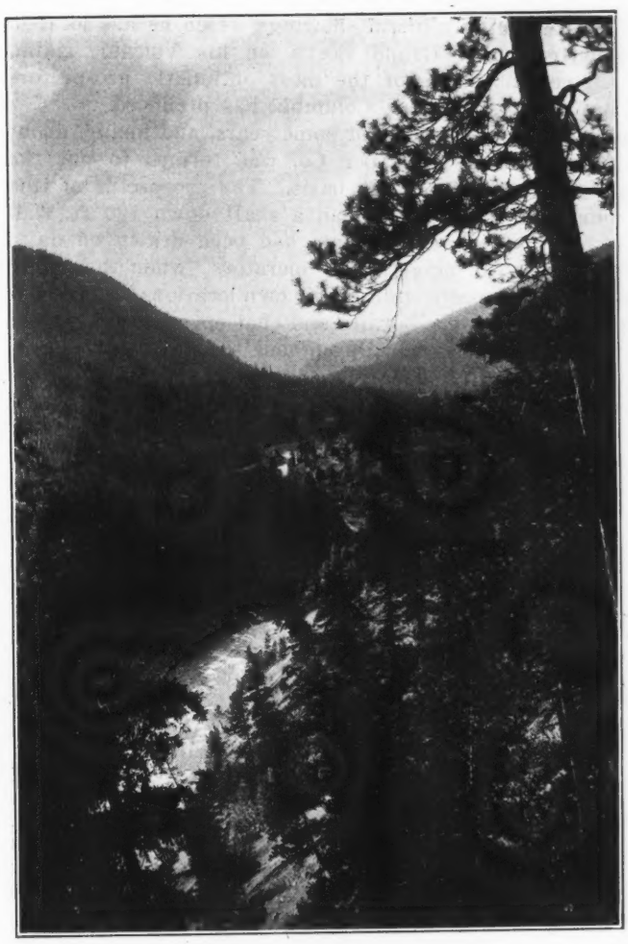
Oroville, just south of the boundary line, dates its importance from 1908, when the Great Northern Ry. was built into that place. Numerous showings and small mines are found around Oroville and the neighboring towns of Nighthawk and Loomis, but so far operations have been of an intermittent nature.

During the war Oroville was the center of an epsom-salt industry, the raw material being collected from some dry lakes in the Kruger Mountain district near by. A gold mine north of the town has been worked at different times, and just north of the boundary line are the Dividend and Lake Shore mines, which have shipped a small tonnage of gold and copper ores, mainly of low grade.

There are several gold properties near Nighthawk, and some silver properties, of which the Ruby is the most important. The Pittman Act is therefore of interest to this locality. The Copper World Extension mine is also tributary to Nighthawk. Loomis is the location of the notorious Palmer Mountain tunnel, a project of the 90's in which a long tunnel was driven and a huge concentrator erected without any ore in sight. The cessation of work at the Boundary smelters has been a serious matter for those mines that ship ores of medium grade in small amounts, as there is not sufficient tonnage to warrant a local plant and freights to more distant smelters are prohibitive.

The most valuable natural resource of this section is, however, an inexhaustible water supply, which is used for power and irrigation in the valley. The result is that Oroville is not dependent on the transitory importance of a mining industry, but can count on regular annual returns from agricultural resources.

Between the Boundary and Hedley, a distance of thirty-four miles, the mining industry is not important. The Horn Silver mine, near Similkameen sta-



TULAMEEN VALLEY ABOVE PRINCETON, B. C.

tion, is the only regular shipper, and its output is small, about 1,000 tons of 40-oz. silver ore per year. The citizens of Keremeos, like those of Oroville, are concentrating their attention on irrigation. Finer peaches and tomatoes than those grown in this district are not produced anywhere. There is also much additional fruit land below Keremeos, with smaller areas above as far as Hedley. Beyond Hedley fruit does not do so well.

Just above Keremeos are large talus piles, which extend for a couple of miles along the northern side of the river. These were noted by Dawson in 1877 and referred to as follows: "The rocks of the mountain are everywhere traversed in all directions by innumerable jointage planes. Exposed faces are thus easily crumbled down, and under the influence of weather contribute annually to the great slopes of broken rock, or *screes*, by which the valley is here fringed."

At the junction of the Similkameen and Twenty Mile Creek, at an elevation of 1,700 ft., are the town of Hedley and the Nickel Plate mill. Fifteen thousand feet distant by tram, but at an elevation of 5,700 ft., is the Nickel Plate mine. The ore from this mine is brought by a narrow-gage electric railway to the tipple, which is on the mountain directly above the mill, and from there to the mill by a gravity tram. The vertical distance covered by this tram is 3,600 ft. in about 8,000 ft., and it is therefore one of the landmarks of the district. There are few transportation departments of mining companies that can offer a more spectacular trip than a ride on this tram.

The development of the Nickel Plate mine is due to the initiative of the late M. K. Rodgers, to whom also can be given the credit for the early development of the Hidden Creek mine, at Anyox. Work was first started on the Nickel Plate mine in January, 1899, and the first ore was milled in 1904.

The orebody is made up mainly of garnet, calcite, and epidote, with arsenopyrite as the chief ore mineral. It is of the contact metamorphic type, lying between a gabbro intrusive and the altered limestones. The ore deposit is unique inasmuch as arsenopyrite has not before been found in contact deposits. Its dip of 25 deg. to 40 deg. is also much flatter than usual. In 1917 the reserves were stated as 423,552 tons averaging $10.39 per ton.

The mill has forty stamps, with a capacity of over 200 tons per day. Until 1916 the main product was concentrates, which were shipped to Tacoma. Since then all the ore has been cyanided at the mill. In recent years the arsenic has been recovered.

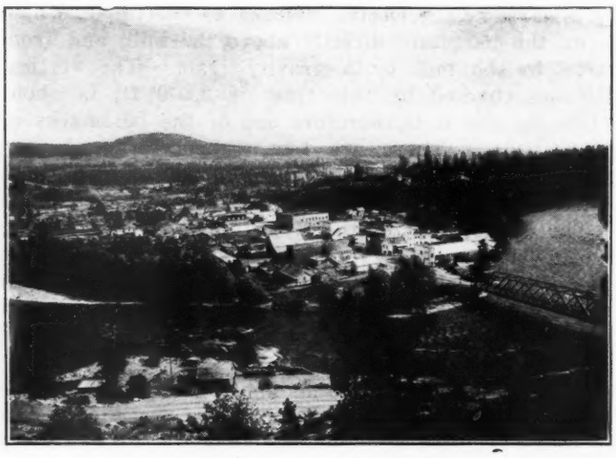
To date about 850,000 tons, valued at $10,000,000, or about $12 per ton, has been treated. The following report for 1914 shows the results for a typical pre-war year: Tonnage treated, 78,494, having an assay value of $10.80; recovery, 94.09 per cent of assay value, or $797,340.76; expenditures, $409,112.11; profits, $388,228.65. Pre-war dividends were usually at the rate of $300,000 per year, or 25 per cent on the issued capital. During recent years profits were practically wiped out,

VALLEY OF SIMILKAMEEN RIVER AT RIGHT. HEDLEY AND VALLEY OF TWENTY-MILE CREEK AT LEFT. MILL AND GRAVITY TRAMWAY OF HEDLEY GOLD MINING CO. IN LEFT CENTER

owing to circumstances under which gold mines worked, and the plant was closed down last summer pending improved conditions. It is thought that it may resume soon.

From Hedley to Princeton the country is picturesque, and, although there are numerous prospects, from some of which shipments have been made, no important mine has yet been developed.

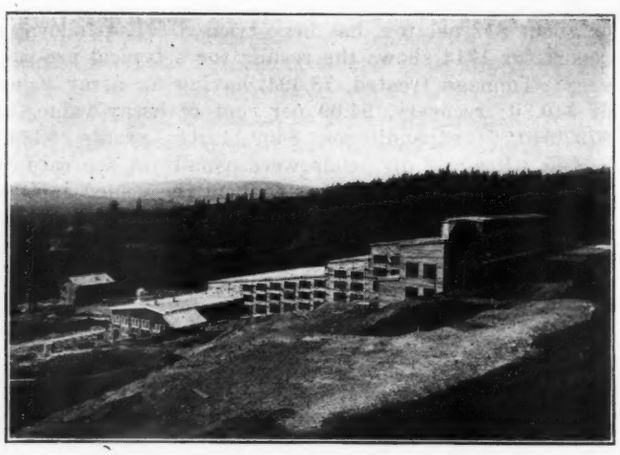
Princeton is known in the old records as Vermilion Forks, from a highly colored cliff situated three miles



PRINCETON, B. C., FROM THE EAST

up the Tulameen River. At Princeton there is a marked depression in the surface of the country, the land sloping gradually to the higher adjacent areas. A coal mine is situated near the town, and, with the recent activity in ranching, railway building, and mining, Princeton has been the most important center in the entire district.

Thirteen miles south of Princeton, by railway, is Copper Mountain, the location of the Sunset and other



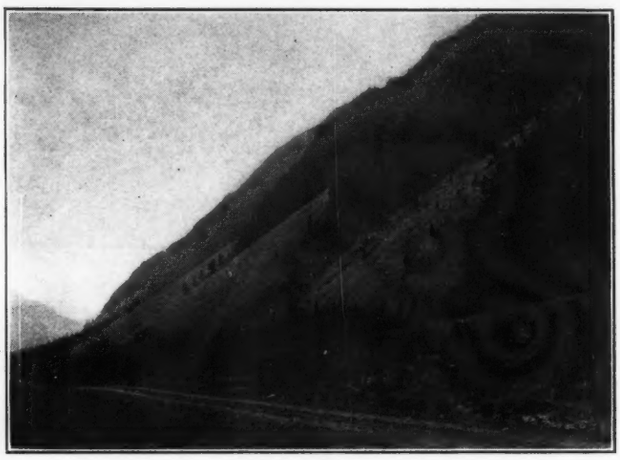
MILL OF CANADA COPPER CORPORATION AT ALLENBY, B. C., NOW IDLE

claims, which form the mining property of the Canada Copper Corporation, formerly the British Columbia Copper Co. Since the exhaustion of the Boundary ore deposits this is the largest copper property in the interior.

The Sunset claim was located in 1888 by R. A. Brown, trapper, fur buyer, and prospector, while on a fur-purchasing expedition. Mr. Brown, widely known as "Sunset" Brown or "Volcanic" Brown, from the names of the striking mineral showings which he has located, still lives near Grand Forks, on his Volcanic claim, and continues one of the most optimistic prospectors that southern British Columbia has produced.

The Sunset lay idle for some years, and finally, about 1900, the Sunset Copper Co. was formed to put the property on a producing basis. The prospectus of this company shows that it had a shaft down 190 ft., "all in ore," and that the dump had been drawn on quite extensively by neighboring operators "when they were shy of good specimens on their own locations." The copper minerals were bornite and chalcopyrite, which were "dissimulated" evenly throughout the mineral zone. A tonnage of 7,125,000 was announced, said to average 5 per cent copper. Though there is no doubt some of the ore was of that grade, and even better, and that the entire tonnage "should" have equaled 5 per cent, the facts of the matter are that it didn't. This circumstance, together with the facts that the ore was not of a good smelting grade, that the flotation process was unknown, and that there was no railway within 100 miles, was responsible for the property remaining idle another decade.

About 1910 the railway reached Princeton, and in



TALUS PILES ABOVE KEREMEOS, B. C.

1912 the B. C. Copper Co., then operating the Mother Lode mine and the Greenwood smelter, took an option on the property, and after extensive drilling and development stated that over 11,000,000 tons of ore had been blocked out, and that this did not exhaust the possibilities of the area. This ore has a content of 1.77 per cent copper, and about 25c. in gold and silver. The analysis is approximately 50 per cent silica, 6 per cent iron, 9 per cent lime, 1 per cent sulphur, and 20 per cent alumina.

A suitable millsite was selected five and one-half miles from Princeton, on the railway route to the mine, and arrangements made with the Kettle Valley Ry. to build a spur. The West Kootenay Power Co. also agreed to extend its power line nearly 100 miles from Greenwood to the mine. Work was also started on the erection of a suitable mine plant and town, on the building of a 2,000-ton mill and a town at the millsite, which was called Allenby, and on a pumping plant 600 ft. below, on the river. Owing to war and post-war conditions delay after delay occurred, and, as evil fortune would have it, after eight years' development and construction, during a period mainly of high cost of materials and high copper prices, the work was completed and

the mill started to ship concentrates in the fall of last year, just as copper slumped to pre-war prices. The operations were, however, continued for several weeks, showing that few changes would be required from a technical point of view, and the plant closed down until the arrival of more normal conditions.

The district beyond Princeton, drained by the Tulameen River, has been important in the past on account of the gold and platinum placers, and, mineralogically at least, for the occurrence of diamonds. Copper and silver-lead deposits have also been located and developed to some extent. The fact that the coal mine near Coalmont is in operation, in addition to the one at Princeton, and has extensions outlined for the future, is one of the encouraging features of the district.

Nearly all creeks flowing into the Tulameen show gold in the gravels, and the value of the output to date is over $750,000. In 1886 there were over 2,000 diggers on Granite Creek. The known placers are now all exhausted.

In addition to the gold, some of the creeks have produced platinum, and about $50,000 worth has been recovered, most of it in the early days when it was of little value. The district has been studied carefully, and the source of the platinum has been traced to the exposure of basic rocks indicated on the map. This rock mass consists of a stock containing a core of peridotite which shows a gradual transition, usually within 100 ft., into the surrounding pyroxenite. It is only the creeks which have their origin in this mass that produce platinum. The platinum grains found also include inclusions of olivine, chromite, and pyroxene, which are also constituents of the mass. The mass has also been examined, and, where altered to serpentine or where rich in chromite, platinum has been found in roughened scales or sponge-like masses. It would therefore appear that it is derived from these rocks by ordinary processes of decomposition, erosion, and stream concentration. The chromite segregations so far found are, however, small, seldom more than a few inches wide by a few feet long, so that the chances of finding ore in commercial quantity are slight.

The diamonds found to date have been of microscopic size and are also a constituent of the chromite segregations. It is possible that, owing to erosion, larger diamonds may be found in the placers, though so far none have been discovered.

Copper ores have been found and worked at Law's Camp, at the headwaters of Bear Creek, and near Tulameen, and segregations occur in the pyroxenite. Silver-lead ores occur at Summit Camp. No outstanding deposits of these metals have been located to date, and no shipments have been made.

The district has a valuable asset in the coal basins at Princeton and near Coalmont. The Princeton coal is a high-grade lignite and makes a good domestic coal. A minimum of 166,000,000 tons of workable coal has been estimated. It is being worked by the Princeton Coal & Land Co., with a colliery at Princeton.

The Tulameen area, near Coalmont, contains a good grade of bituminous coal of good coking quality and a minable content of 64,000,000 tons. It is operated by the Coalmont Collieries, Ltd., in which Winnipeg and Vancouver interests are represented. During the past season this company installed a wire-rope tramway from the mine to the shipping station at Coalmont and is now shipping 250 tons per day, which is all taken by the railways. Later the company expects to enter the Vancouver market.

The Similkameen district was explored by Dr. G. M. Dawson, of the Canadian Geological Survey, in 1877. His reports are valuable and interesting, but have been out of print for years. Prof. J. F. Kemp has also studied the occurrence of platinum in this district in detail, and Bulletin 193 of the U. S. Geological Survey constitutes his report. This is also out of print. Charles Camsell, now Deputy Minister of Mines at Ottawa, did his most important geological work in this

ON THE TRAIL NEAR TULAMEEN

district, and his reports on Hedley (Memoir No. 2) and on Tulameen (Memoir No. 26) are still available.

No article on the Similkameen would be complete without some reference to Colonel Robert Stevenson, pioneer of California, Cariboo, Similkameen, and the Okanagan. Born in 1838, in Glengarry County, Ont., he went early in life to British Columbia. He took part in the rush to Rock Creek in 1860, and his work there so favorably impressed Sir James Douglas, who was then governor of the colony, that he appointed him collector of customs at Osoyoos in 1861. A few years later he was in California as a private in the Confederate army, but did not get to the front. His title, therefore, is not due to military experience, but was given him by Sir Richard McBride, when premier of the province, many years later. He was back in British Columbia in time to see most of the busy days in the Cariboo and also to explore the more southern districts. He has many stories to tell of the Cariboo and the administration of justice by Sir Matthew Begbie. He knew personally most of the leaders of those days and many of the Indian chiefs, such as Tonasket, whose names now appear as place names in the railway folders.

On one trip in the Tulameen Colonel Stevenson says that he came across a vein of solid platinum four inches wide running under a stream flowing through a canyon. A sample was taken, but the Indian to whom it was given to take out lost it. On returning to the place at a later date it was found to be covered by a rock slide. Colonel Stevenson has spent much time in clearing this up, and looks forward to the day when the re-discovery will make him a wealthy man. "I have other properties that also need my attention," he says, "but I am eighty-two years old, and I will have to hurry." The Colonel is still in excellent physical condition, and it is the hope of the district that he may live to see his famous platinum vein again.

Making Mining Engineers From Disabled Soldiers

Hundreds of Thousands Expected To Take Advantage of Federal Vocational Education Opportunities—Courses in Schools and Colleges Supplemented By Practical Work—Success of Plan Depends on Co-operation of Employers

By W. A. Clark
Federal Board for Vocational Education, Washington, D. C.
Written for *Engineering and Mining Journal*

THE DISABLED SOLDIERS who learn and practice the profession of mining engineering will probably be as efficient as the civilian students. In fact, something gained during the war may prove an additional asset. The Government and employers are partners in the job. If the employer does not take an active, critical interest and a partner's interest in this work, and do his part, the Government will fail. Engineers represent the big employers. It is hoped that many of them will see what they can do to stimulate and educate employers, and offer to the board such constructive criticism as they think will be for the best interests of the disabled soldiers.

First consider the general features of the job. The task of rehabilitating ex-service men who have a vocational handicap was assigned to the Federal Board for Vocational Education more than two years ago. The enabling act is quite clear in its intent. For those who are, in the judgment of the board, vocationally handicapped. the board is obligated "to do all things necessary to insure vocational rehabilitation; to provide for the placement of rehabilitated persons in suitable and gainful occupation." To achieve this purpose it devolves upon the board to select an employment objective for each disabled soldier who is eligible and who desires training, and train him until he has sufficient mastery of his new vocation to command the average wages. In at least 90 per cent of the occupations for which disabled soldiers are being trained, this acid test of rehabilitation can be applied, because the average wage "at starting" is determinable. In the other 10 per cent, the application of the principle is merely a matter of common sense.

VOCATIONAL STUDENTS IN THE MECHANICAL DRAWING LABORATORY OF THE MICHIGAN COLLEGE OF MINES

Problem Was First Underestimated

One of the important pioneers in this educational work thought the board might have to train 15,000 men. It is clear that little was known about the size of the job at the start when this figure is compared with the 86,000 who have already entered training. After two years it is still difficult to form a reliable estimate. An increasing number of men are becomning eligible for training because of disability *traceable to service*. This is the big joker in the problem. Theoretically, any one of the four million ex-service men may develop a disability traceable to the service and be eligible for training under the present law.

No time limit has thus far been fixed within which applications must be made. Every man is entitled to training, including books and supplies, if he is receiving compensation; also if he has a vocational handicap he is entitled to receive subsistence pay. This pay is $80 to $100 per month, and more in case of dependents. Only a small percentage of the men eligible for training without pay accept. It is to them only a tantalizing offer, devoid of substance. On the other hand, a large percentage of the men eligible for training *with* pay do accept. The number of men who apply and the number of men who will accept, if eligible, and if training is feasible, depends largely upon employment conditions. If unemployment increases, the number who accept training will increase; if it contracts, a large number will decline training, particularly if the wages offered are in excess of training pay. At present there is a strong tendency to liberalize the present law and give men with a 10 per cent disability training with pay. This will have a stimulating effect on both applications and acceptances.

Total Cost About $4,000 Per Man

How much is it going to cost? Training is an individual matter, and must continue, within reason, until a man's employment objective has been reached. Consequently, on account of differences of preparation for a definite employment objective, together with differences in energy, ability, and other qualities, the time element is hard to determine. Perhaps the time of training will average two years, including those who train for short periods and those who are discontinued because they will not profit by their training. The monthly cost of trainees, including 11 per cent overhead, is $170. An approximate figure of $4,000 for a two years' course gives some idea of the cost.

So many indeterminate factors enter into the problem of the total number of men involved that it is impossible even to guess what the total cost will be. As to the kind of machinery and equipment used, the board faced two choices: to use existing educational plants, or to build new ones. It was determined to use existing plants; first, because they were ready and the men clamored to start their training; second, it was thought desirable to strengthen existing educational institutions, rather than to weaken them through competition; third, these educational plants were widely distributed and permitted most men to train at or near their homes; and fourth, it was more economical.

Contracts were made with selected institutions that offered the most satisfactory courses. This form of training was soon supplemented by practical work. At present the board has training contracts with over 2,000 educational institutions and over 10,000 employers. The sheer pressure of the work of deciding on eligibility for training, arranging employment objectives for those who desire training, selecting places and inducting men into training has prevented those in administrative positions from making a comprehensive and critical survey of the educational facilities employed. It is thought that such a survey could best be made by a selected committee of large employers, representatives of labor, and production engineers, a carefully chosen group, large enough to represent the various occupations for which men are being trained. Such a committee, selected by the board itself, could accomplish much within a short time. Occupations could be grouped, subcommittees appointed for each group, and typical schools and establishments selected and studied. This plan of survey which the board has under consideration can be made effective only if there is the right kind of co-operation from public-spirited employers.

FEDERAL BOARD STUDENTS AT THE SCHOOL OF MINES, BUTTE, MONT.

STUDENTS FROM ALL CLASSES MUST BE CONSIDERED

Now, in regard to the men. Here is where the greatest difficulties exist. If the job called for the vocational education of 200,000 young men who were normal, and properly prepared to enter training for a definite calling, that alone would represent a huge educational and administrative task, but the difficulties, after all, would be of the normal type. But though the number of disabled soldiers, trainees of the board, who are approximately normal, is increasingly large, the number who are appreciably abnormal from shock, gas, disease, and wounds runs into the thousands; the number who are eligible to train but not feasible to train yet, because of mental diseases, tuberculosis, and other causes, runs into thousands. In the composite group will be found disabled ex-service men from every college and university in the country, from nearly every important commercial, technical, and trade school, and thousands from industrial and commercial establishments representing almost every known occupation.

There are men with an incomplete common-school education, including large numbers of illiterates and foreign born. On the other hand, there are men with academic and professional degrees, and many with partial or complete high-school training. The foreign-born illiterates are eager to speak the language and know something of the history and government of the country they fought for, as well as to learn some useful occupation. The gifted, highly trained men need to learn a new specialty to overcome their vocational handicap. Some regard their training pay only as a new form of pension, carrying with it no obligation to profit by the opportunity for self-rehabilitation.

The effort of the training officer to stimulate self-respect and an honest effort toward self-rehabilitation is frequently frustrated or delayed by interference on the part of sentimentalists. Perhaps at no point is there need of greater wisdom than here; and the student must be taught that the Government can only give the opportunity, and that he himself must recognize an obligation to work hard and to accomplish something. The moment training pay is permitted to become a camouflaged pension a disintegrating factor enters into the whole plan.

The organization of the Federal Board is more com-

pletely decentralized than any department of the Government. There are fourteen distinct geographical divisions of the whole country, and many subdivisions of each zone or district. In all, there are more than 140 local offices. After a man has been declared eligible, his case is sent to the proper local office, and the supervisor is held responsible for the induction into training and the supervision of his training. In a large minority of cases considerable experimentation is essential before an employment objective is selected, and frequent changes are often necessary even after a selection has been made. Wastage here, both of time and money, is greater than at any other point.

THE MINING CONTINGENT

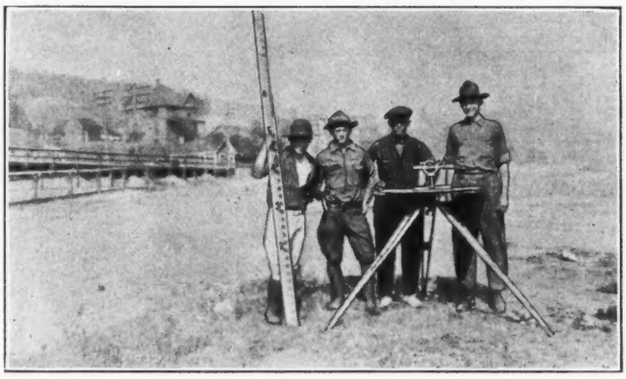
What is the Federal Board doing for men who have chosen employment objectives connected with the oil industry, and coal and metal mining? Perhaps 750 men have selected such objectives, exclusive of electricians, accountants, and others, some of whom may find their way into the employ of oil or mining companies. Of this number perhaps about 75 are taking regular mining-engineering courses leading to a degree. These men are distributed among the best schools of the country, including the Massachusetts Institute of Technology, Harvard, and the Michigan College of Mines. Some have selected assaying, some oil technology and engineering.

Though the bars have not been let down for those who want a degree, either in mining engineering or any other profession, many universities and technical schools have planned special courses to meet the practical needs and educational background of Federal Board students. For instance, the president of the New Mexico State School of Mines takes a great personal interest in the education of disabled soldiers. Short practical courses in surveying, assaying, chemistry, and drafting have been planned by him for men who could profit by the courses but who had insufficient preparation to take the regular courses in engineering. The Colorado School of Mines, on the other hand, has a number of Federal Board students, but they are taking the regular courses. "War Specials" are not admitted.

The State School at Pittsburg, Kan., Carnegie Institute of Technology, and the University of West Virginia have planned short courses particularly adapted to men with large practical experience as coal miners. Many of them are wholly unable to work as miners, on account of their disabilities; nevertheless, it is highly desirable to capitalize their experience, if possible, so they are taking courses which will fit them to secure positions as foremen, fire bosses, and in other capacities about a mine. The Allegheny Vocational School, at Pittsburgh, has planned two practical courses to meet the needs primarily of ex-coal miners whose disabilities render it impossible for them to go back to mining. Both courses usually call for considerable preliminary training in English and arithmetic. One deals with simple timekeeping; the other and supplementary course with payroll accounting. The best methods employed in coal companies furnish the technique and illustrations.

I recently returned from an extended inspection trip, visiting many universities, colleges, technical, trade and industrial schools where disabled soldiers are being trained. In the schools where there are twenty-five or more a counselor (one of the professors) or co-ordinator (a Federal Board official) usually advises the men, and in fact acts as guide, counselor and friend. He is called upon to adjudicate every type of difficulty. One of several questions that I invariably asked was: "What percentage of the men fail to profit by this training?" The usual answer was 10 per cent, sometimes 5, seldom over 10. Another stock question was: "Is there an improvement in morale?" Always the answer came, "Yes." As a rule the further observation was made that the men were mentally more alert, less nervous, and much easier to guide. Deans, professors, counselors, co-ordinators, and trained officers with practical business experience were asked repeatedly: "Is the training that the men get calculated to fit them, without loss of time, for their employment objectives?" Frankly, the answers were seldom an unqualified "Yes." Frequently it was implied that Federal Board students with definite employment objectives had clearly revealed the gap between education and the job.

Undoubtedly Federal Board students are getting the best training that the schools can give. To say that it



PLANE TABLE WORK AT THE MICHIGAN COLLEGE OF MINES

is good enough would be going too far. Practical, progressive, co-ordinated training for the job is being provided in many establishments; but in others it is being given in an ineffective way. This method of training, however, offers, in my judgment, greater possibilities for sound training in many lines than the school. It should be surrounded, however, with safeguards to prevent exploitation.

Floating an Antimonial Silver Ore

Tests made by the U. S. Bureau of Mines in co-operation with Idaho state bureaus, on an antimonial silver ore, are described in U. S. Bureau of Mines Bulletin 205, recently issued. The principal mineral was polybasite $(Ag,Cu)_{18}Sb_2S_{12}$, which was finely disseminated through a hard, massive, quartz gangue. Analysis showed, Au, 0.04 oz. per ton; Ag, 81.4 oz.; Fe, 1.13 per cent; S, 0.15 per cent; "insoluble," 97.6 per cent. The following conclusions were reached:

1. The ore is amenable to flotation.
2. Pretreatment of the ore by sulphidization with sodium sulphide improves the silver recovery.
3. Treatment of flotation tailings on tables would seem advisable if much of the silver mineral is oxidized, and might eliminate the sulphidizing of the ore.
4. Use of sodium cyanide with the flotation agents seems to improve the grade of product.
5. It would seem advisable to make first a high recovery of silver without cyanide, then to re-treat the first flotation concentrate with a small quantity of cyanide, in order to improve the grade of the product.

Government Officials Prominent in Mining

Senator Tasker L. Oddie

BY PAUL WOOTON
Written for *Engineering and Mining Journal*

CONSIDERING the fact that mining vies with agriculture in the matter of fundamental industrial importance, there never has been adequate representation of the mining industry in Congress. In fact, few members of the National legislative bodies have had first-hand practical mining experience. As a consequence the mining industry and those industries allied to it have been compelled to place great reliance upon such few members of Congress and various Government departments as have an intimate knowledge of that business. To the little group of men now in Congress who have had actual and practical experience in mining and in industries related to mining there just has been added Tasker L. Oddie, who has with the present session begun his service to the Government as a Senator from Nevada. Feeling as he does that he has a responsibility to the mining industry as a whole, Senator Oddie expects to give mining matters first call on his consideration and his time. He is particularly interested in legislation which will have the effect of holding out more encouragement to the prospector. Senator Oddie has been connected actively with mining since 1898. In that year he was sent to Nevada to take charge of the interests of Anson Phelps Stokes. Prior to that time he had had no knowledge of mining or of the mining industry. He was born in Brooklyn and grew up in East Orange, N. J. After completing a public-school education he begun fitting himself for the practice of law at the night school at New York University. His livelihood was obtained in the Stokes offices, where he looked after his employers' real-estate interests. His work there soon demonstrated the fact that he was a young man of good business judgment, which resulted in his dispatch to Nevada.

SENATOR TASKER L. ODDIE

Soon after Mr. Oddie went to Nevada, the Stokes interests discontinued their mining operations there. Rather than return to New York, Mr. Oddie set out for Nye County to undertake, with limited capital, an operation of his own. He began prospecting alone on an outcrop in the region of the old Belmont mine. He started an incline on the vein and constructed a hand windlass. He did all the work himself. He would fill his bucket, and then climb to the surface to hoist it. Later he was forced to abandon work and his hope of making a success of that property. The experience, however, did not discourage him. Having been told by Jim Butler, a Nye County acquaintance, of a promising prospect in an out-of-the-way section of the county, Oddie agreed to secure assays of the samples which Butler had turned over to him. As neither he nor Butler had the money to pay for the assays, Mr. Oddie had to rely upon persuasion, and he did finally succeed in getting a friend to make the assay. He was enthused and encouraged as never before when he learned that the samples ran very high in silver. On the strength of these assays, Oddie, Butler, and Wilson Brougher made a world record on an investment. The investment consisted of a few dollars' worth of supplies and tools, with which they set out for the distant vein from which the samples were taken. There they worked and suffered hardships as great as white man ever underwent in similar circumstances. The first shipment of ore netted them the tidy sum of $600, and the property paid its way thereafter. In a year the partners had 1,000 horses and mules hauling the ore sixty miles to the nearest railroad. This was the beginning of the Mizpah mine, in the great silver camp at Tonopah. A year later, the property was sold for $350,000. With the capital acquired from this operation, Mr. Oddie turned his attention to the near-by Belmont, which became even a greater producer than the Mizpah.

From his youth, Mr. Oddie has taken more than the average interest in politics. In 1910, Nevada Republicans induced him to make the race for Governor of that state. He was elected, and served for four years. Immediately after retiring from office, he resumed mining activities, and he is still largely interested in various leases and mining operations in his adopted state.

Waste in Phosphate-Rock Production

BY STRAUSS L. LLOYD
Written for *Engineering and Mining Journal*

MENTION OF THE WASTE in Southern phosphate-rock mining as stated in *Engineering and Mining Journal* of March 19, reminds me that there is considerable loss of phosphate rock in the actual mining of the material. In the hard-rock section of Florida practically all the deposits contain, with other substances, phosphate in a soft or pulverulent condition. Under present methods of mining and treatment this "soft" phosphate is necessarily lost in the process of washing, being carried to the dump, along with the sand, clay, and other constituents of the matrix. The amount of phosphate thus discarded may be expected to vary with different deposits and under different conditions.

After reaching the dump there is more or less mechanical separation, so that samples taken from one part of the dump may be found richer in phosphate than those from some other part of the same dump. Samples from some of the phosphate dumps in the hard-rock region of Florida, which I took at random and analyzed, gave the following analyses: Total phosphoric acid, 9.99 to 12.14 per cent, which is equivalent to 21.81 to 26.50 per cent tricalcium phosphate. In another case, a sample of float from the dumps in the land pebble section gave results as follows: Total phosphoric acid, 11.47 per cent, equivalent to 25.04 per cent tricalcium phosphate. In still another analysis made of the plate-phosphate, results were: Silica, 58.95 to 60.10 per cent; iron and alumina, 11.70 to 11.20 per cent; calcium phosphate 26.80 to 27.92 per cent. It was estimated in this particular instance that approximately four tons of material was excavated and washed to obtain one ton of high-grade 77 per cent phosphate. From this it is evident that of the material taken from the pit, three-fourths, carrying about 27 per cent calcium phosphate, goes to the dump, and one-fourth, carrying 77 per cent calcium phosphate, is saved; thus of the total phosphate rock taken from the pit, in this example at least, one-half goes into the dump.

ACID AND FUSION TREATMENTS GIVEN

Practically all of the phosphate ore mined at present is converted into superphosphate by treatment with sulphuric acid. The phosphoric-acid manufacturers demand a rock notably free from iron, alumina, and calcium carbonate. As a consequence it has been estimated that for every ton of phosphate rock that is converted into the superphosphate by treatment with sulphuric acid, two tons are discarded as unsuitable for such treatment.

The fusion of a mixture of phosphate rock, sand, and coke in an electric furnace permits the volatilization and subsequent collection in the Cottrell precipitator of phosphoric acid of satisfactory purity and concentration. If water power were obtainable at $6 a horsepower-year, this method would be adapted commercially, but at the present price, $20 to $25 per horsepower-year, the cost of production of phosphoric acid by the electric furnace is about three-quarters of a cent higher than by the sulphuric-acid treatment. Moreover, it is not likely that water power will ever be available in large quantities at a price sufficiently low to warrant its use in the production of phosphoric acid, which must be sold on the ton basis, while there is such a large and rapidly increasing demand for power by producers of the more expensive chemicals sold on the pound basis. Recent work in which oil fuel is used as the heating agent, instead of the electric furnace, gives promise of a commercial method for preparing phosphoric acid. The original Cottrell process was designed for fume-controlling, and by means of it the solid particles, which cause damage to crops, were separated by static electric discharges.

A recently conducted experimental plant operating on the Cottrell principle had an electrode area of 100 square feet, and was designed to handle 70,000 cubic feet of smoke per minute. The apparatus consisted of a precipitating chamber in which were placed 127 electrodes, strips of iron 4 ft. long by ¾ in. wide, with saw teeth throughout their length. Between the electrodes were placed flat plates of iron about six inches wide. An electrical current of 27,000 volts was delivered to the electrodes, and as the smoke circulated in the chamber the solid particles was precipitated on the plates.

PHOSPHORIC ACID DIFFICULT TO HANDLE

The experimental plant showed that 90 per cent of the solid particles carried by the smoke are precipitated by this method. The gases from the main flues were drawn into the precipitating chamber and driven into the main stack by two fans 187 inches in diameter, whose combined capacity was 500,000 cubic feet per minute. Nine permanent units comprised the plant, seven for constant service and two for reserve purposes. The cost approximated $125,000.

There are advantages and disadvantages in the use of phosphoric acid. One of the disadvantages is the difficulty attending the transportation of a corrosive liquid. However, this can be readily overcome by converting the acid into one of its solid salts. Some of the advantages are that it can be produced at the mine from run-of-mine material, because the presence of impurities which offer objections to sulphuric-acid treatment are necessary for successful furnace treatment. If the rock is high grade, sand must be added to displace the phosphoric acid. The presence of relatively large percentages of alumina, instead of being a drawback, greatly facilitates the smelting of the phosphate charge. The mine-run material, therefore, is generally more suitable for fusion work than high-grade rock.

It seems best to convert the phosphoric acid produced from furnace operations into a solid salt by neutralizing it with ammonia or potash. The substitution of these bases for lime saves a considerable part of the freight and yields a soluble product which does not revert to an insoluble compound, as with the acid calcium phosphate. The fusion process will have other advantages, in that several of the products from the nitrogen-fixation plants in the South can be freely mixed with the ammonium or potassium phosphate, which cannot be mixed with the acid calcium phosphate without reversion of the latter and decomposition of the fixed-nitrogen product.

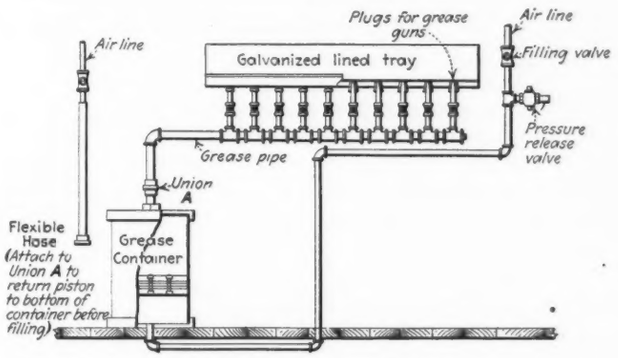
HANDY KNOWLEDGE

Storing and Distributing Grease, Using Air Under Pressure*

BY F. J. EAGER

In various mining and smelting operations large amounts of the different oils and greases are used, and the supplies are commonly stored at central points, from which they are issued daily in small quantities. For the purpose of storing and issuing oils, several excellent tank and pump systems have been developed. By these means the different oils may be conveniently stored and issued in a clean and efficient manner. The greases, however, are by their nature more difficult to handle, and I do not know of any devices by which they may be handled in similar ways.

This difficulty became evident some time ago when the underground drill was changed from the piston to the Leyner type. It then became necessary to use grease as well as oil for lubricating the drills, and small quantities of grease had to be issued daily to each drill runner.



DEVICE FOR STORING AND DISTRIBUTING GREASE, USING AIR UNDER PRESSURE

The drillers take the grease into the working place in what we call "grease guns." The "guns" hold sufficient grease for a working shift, the grease being forced from the "guns" into the drills. At first the grease was allowed to remain in the original container, either a tub or a barrel, and filling the grease "guns" was a slow and dirty operation. It was accompanied by appreciable waste, and the grease often came in contact with, and picked up, dust before it was introduced into the drills.

To overcome these difficulties, we have devised a machine by which, with the aid of air pressure, all the lighter grades of cup greases can be handled as easily, as efficiently, and in as clean a manner as oils. The details of this machine are shown on the accompanying drawing. The device has three essential parts:

The first is the grease container, which is a bored iron cylinder, inside of which there is a piston without a rod. This piston is built up from three steel plates and two leather packing rings, and travels from the bottom to the top of the cylinder.

The second part of the machine is the grease-distributing system, through which the grease is piped from the top of the grease container to the different discharge openings. These openings may consist of taps of any desired form of discharge opening. In the machine in question the grease is forced to a manifold pipe, which is fitted with a number of ⅜-in. couplings to which the grease "guns" are screwed for filling.

The third part of the device is the operating arrangement. This consists of an air-pressure line that enters at the bottom of the grease container. This line has an operating valve and also a pressure release valve. The latter is placed between the operating valve and the grease container. At the left of the drawing will be seen a section of flexible rubber hose that terminates with a union.

The device is used in the following manner:

The grease-container cap is removed by unscrewing. With the piston at the bottom of the cylinder, the container is filled with grease. In this particular machine, the container has an inside diameter of 12 in. and is about 20 in. in height. It holds about 60 lb. of grease, and therefore takes easily the contents of a 50-lb. tub. This charge will fill from 125 to 150 grease "guns." After filling the container, the grease pipe is attached and the machine is ready for use.

In the regular routine all the grease "guns" are filled at one time. Ten can be filled at one operation. A grease "gun" is attached to each filling plug while all the filling-plug valves are open. The operating valve is then opened, and the "guns" are quickly filled. If fewer than the total number of plugs are to be used, the valves of the other filling plugs are closed. Before unscrewing the grease "guns," after filling, the pressure on the grease is relieved by closing the operating valve and opening the pressure-release valve.

When the grease container becomes empty, the grease pipe is disconnected at the union at the top of the container. The rubber hose is then attached to the above opening and the valve on the hose line opened. This returns the piston to the bottom of the cylinder and eliminates having to introduce a dirty implement of any kind into the grease container. The container may now be refilled, after which it is ready for further use in the same manner.

This arrangement is satisfactory for handling and issuing grease. The device is practically fool-proof. It never gets out of order, and there is nothing to wear or be easily broken.

For the purpose for which this machine has been designed, the quantity of grease used at one time is not large. However, the device works so freely that I do not see why much larger quantities of grease could not be stored and drawn off in this same manner. Taps could be used and the grease drawn off in much the same way as that in which we handle oil through tanks and pumps.

*A paper read before the Sudbury branch of the Canadian Institute of Mining and Metallurgy, and printed in the *Bulletin* of that institute, for March, 1921.

Window shades white or light cream in color are preferable to dark shades for engineering offices and drafting rooms having an east or west exposure.

To Lay Off Degrees With a Steel Square

By William Kirkpatrick

Written for *Engineering and Mining Journal*

Referring to the method of laying off angles expressed in degrees with a steel square that is given on p. 391 of the *Engineering and Mining Journal* of Feb. 26, I have used a method for years that appears to be simpler than that. It is as follows:

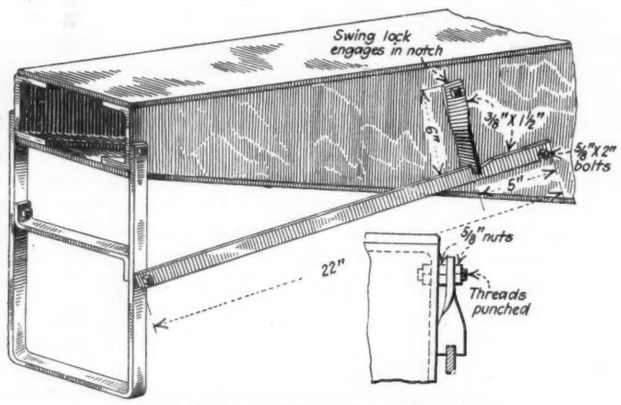
Move the decimal point of the tangent one figure to the right, which multiplies it by ten. Then multiply the remaining figures to the right by sixteen, inserting the decimal point in the proper place in the product, which will give in inches and sixteenths the distance to be used on the tongue of the square while using 10 in. on the blade. If the angle is, say, 40 deg. or less, the tangent may be multiplied by two after changing the decimal point and then using 20 in. on the blade. In that way the square will make a larger protractor.

Movable Steps for Dump Cars

By H. H. Hunner

Written for *Engineering and Mining Journal*

The sketch shows how a stationary brakeman's step may be changed to one that can be quickly moved in or out. To make the change, the diagonal brace is removed and slotted on the lower side to drop over the bolt at the upper end. It is also given a taper notch



MOVABLE STEP FOR DUMP CARS

on the upper edge. The position and detail of the swing lock are shown in the illustration. This does away with considerable train delay on dumps where chunky material is handled. A large chunk hanging up close to the train can be passed without stopping to remove it or without battering the steps by striking it in passing.

Meeting Emergencies at a Chromite Plant During the War

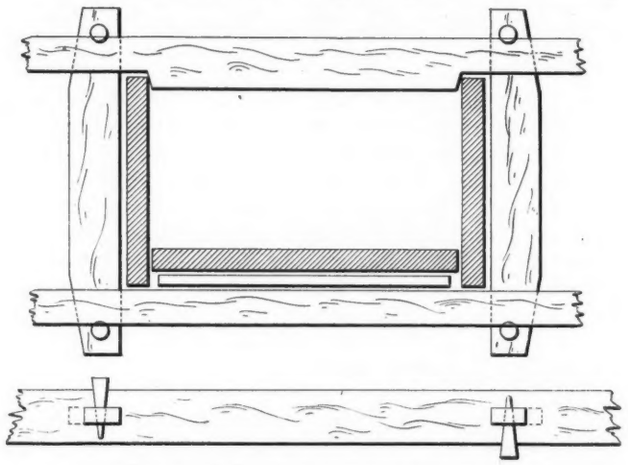
By S. H. Hamilton

Written for *Engineering and Mining Journal*

The winter of 1917-1918 had meatless, heatless and wheatless days, but in the mountains of North Carolina it was chronically nailless, especially with respect to the larger sizes of nails. To concentrate chromite from the rotted dunite it was necessary to build about two miles of flume. Plenty of rough lumber of good quality could be had locally. Labor was of the mountaineer woodsman type. These men are very handy with an axe and really good rough carpenters. It might also be mentioned that the manufacture of locust insulator pins for telegraph cross arms was a local industry.

By making up a supply of cross and side pieces, according to a template, and by generous use of wedges or gluts, made as the work of erection progressed, it was possible to construct an excellent flume in a short time and with the use of few nails.

We had just succeeded in getting the mill running



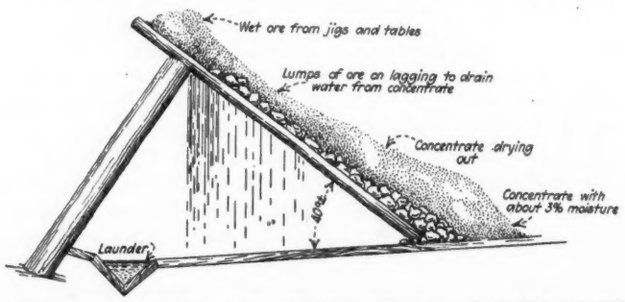
FLUME BUILT WITH WEDGES AND PINS

smoothly when hold-up litigation was begun. While we were shut down and the flume was empty it shrunk to such an extent that it looked as though it could never be used. When we were finally permitted to resume work, I telegraphed our foreman. Much to my surprise and pleasure, when I arrived on the property the next day following, the flume was hardly leaking at all. The only thing done had been to drive up the pins and wedges.

Drying Concentrates by Crude Means

The chromite concentrates made in the mill that was erected in the emergency during the war had to undergo a long haul to reach the railroad station. This was followed by an expensive rail haul. Had it been possible to buy a drier and to succeed in having it delivered, it is a regrettable fact that there would have been no money to pay for it. A home-made drier was devised as follows:

A crude frame was built out of light lagging having


Wet ore from jigs and tables
Lumps of ore on lagging to drain water from concentrate
Concentrate drying out
Concentrate with about 3% moisture
40"
Launder

DRYING CHROMITE CONCENTRATES IN AN EMERGENCY

a pitch of 35 to 40 deg. Some lumps of rich ore were piled on this and on the floor at the base. The concentrates, as made, were poured on the top of this drain pile. An area of about 5 x 6 ft. drained and dried about a half a ton a day in this fashion. As it dried it gradually rolled to the bottom, where it was sacked and shipped with about 3 per cent water.

THE PETROLEUM INDUSTRY

Oil-Shale Deposits in Germany

Restriction of Petroleum Imports Inadvisable—Oil Shortage Encourages Exploration of Shale Deposits, Which Give Evidences of Potential Productivity

SPECIAL CORRESPONDENCE

Germany's pre-war production of natural oil was rather insignificant compared with the tonnage annually required by her industries, a liberal estimate placing the annual output at 8 per cent of the total consumption, and this percentage has now experienced a further reduction by the loss of the famous Pechelbronn wells, in Alsace. In view of the fact that the latter supplied approximately 50 per cent of the entire inland production, the question of increasing production by the exploitation of new wells and deposits is one of the problems ranking foremost in importance with the German industry, the more so as the importation of foreign oils and oil products will probably be restricted to a minimum for some time to come, on account of the deplorable state of Germany's finances.

Foreign oils are not barred from entering Germany; on the contrary, as was stated at a recent sitting of the Technical Committee of the German Mineral Oils Distribution Bureau, a general restriction of mineral oil imports was neither considered practicable nor desirable except in the case of high-priced oils and such products as were supplied in sufficient quantities by the home industry. In the course of the proceedings, interesting data covering German mineral imports were given. The import total of all kinds of lubricating oils during 1920 was estimated at from 170,000 tons to 180,000 tons (compared with an average pre-war import of 260,000 tons). Out of this total, approximately 157,000 tons were mineral oils, which are classed as follows:

	Tons
Crude oils	49,400
Spindle oils	6,100
Machine oils	55,000
Cylinder oils	10,000
Asphalt	11,300
Fats	24,500

It is estimated that about 25,000 tons of oil entered Germany illegally through the so-called "gap in the west."

The existence of bituminous oil-shale deposits in various parts of Germany was known long before the war, but no serious attempts were ever made toward their exploitation. This was due primarily to lack of data regarding the caloric value of the oil and to the relative cheapness of foreign oils. The oil trickling from the deposits was collected and used for local consumption only, serving either as a raw material for the production of cart-grease or as, in the case of the oil extracted from the Tegernsee shale deposits, for medicinal purposes. Isolated attempts were made to distill the oil, but the question of systematic and scientific exploitation of the shale on revenue-paying lines for industrial purposes was not seriously considered.

However, as the war was progressing the shortage of oil made itself increasingly felt, and steps were taken with a view of exploring the oil-shale deposits in Germany and investigating the possibilities for a profitable exploitation. As the result of extensive geological research, the fact became known that shale deposits were of greater occurrence than had been generally assumed, the oil shale being principally a slaty marl. The oil content varied considerably, ranging between 1 and 30 per cent.

As a natural result of formation of strata, the principal deposits are in central and southern Germany, especially around Reutlingen (in Wuerttemberg), where nearly 250 liters of crude oil are obtained from one cubic metre of shale. Some time ago, an enterprise for the exploitation of deposits was formed at Holzheim, with the active support of the state, under the name of "Jura Oelschiefer G. m. b. H." The capital amounts to sixteen million marks, of which seven millions were subscribed by the government. At a recent session of the State Finance Department it was stated that output was satisfactory and that permanent profitable operation seemed assured. The company will principally engage in the extraction of oil, and production of slag bricks—which have proved their serviceableness beyond a doubt—will form a side line of the undertaking.

Other slaty marl deposits of considerable extent have been discovered in Baden, but operations were eventually discontinued after some trial borings, owing to the poor oil content. On the other hand, deposits rich in oil exist in the Harz Mountains, Saxony, Hanover, Hessen and the Alps, as well as Bavaria. In some parts of the Jura Mountains in Bavaria a peculiar kind of oil shale containing approximately 6 per cent oil has been discovered. Before the war quantities were obtained from that source, but operations were discontinued, the cost being too high in relation to the price for American and Russian petroleum.

Owing to aforementioned reasons, it has recently been decided to resume operations, the "Bayrische Mineral-oelwerke" having plants erected in Upper Franconia, near Bayreuth, where schist-oil is to be produced, together with benzine, paraffin, lubricating oils, and by-products. It is planned to use the mineral residues in connection with cement production as well as in fertilizers. Operations will be conducted on an area measuring about 2,700 acres, which has been assigned to the company. The calorific value of the oil is claimed to be equal to that of the more inferior grades of German brown coal.

The extraction of the oil takes place at special distillation plants, the most advantageous process being by the employment of heated retorts, the gas obtained as a byproduct in this process being used for heating the retorts. The ashes serve either as a raw material for cement production or are pressed into briquettes while the crude oil is undergoing the usual distillation process by which benzine, illuminating oil, gas engine oil and lubricating oil are derived. Wherever oil

shale is obtainable at favorable freight rates, it is frequently used as a direct fuel.

No exact figures of the potential productivity of the shale deposits in Germany are available as yet, but there can be little doubt that, with an intensified exploitation of available deposits and continued exploration of new ones, the tonnage annually produced will materially assist toward rendering German industry less dependent upon foreign supplies.

Naval Reserve Lands in California

WASHINGTON CORRESPONDENCE

The Secretary of the Navy has announced that private operators are to be given an opportunity to lease certain sections of the Naval Reserve oil lands in California. The formal statement follows:

"The last naval appropriation act authorized the Secretary of the Navy to operate Naval Reserve lands in California either directly or by lease whenever the interest of the Government would seem to demand such action. A condition has arisen in Naval Reserve No. 1, in California, which makes it necessary for wells to be drilled on Naval lands in order to offset wells drilled on adjacent property and which are now drawing oil from the Naval Reserve lands.

"An advertisement which the Secretary of the Navy has just issued provides for the lease of a certain portion of land for the drilling of a double row of offset wells such as will prevent other operators from securing the oil that is the property of the Navy. The leasing of this land is open to operators of experience who can assure the Navy Department of their capability in the matter, and intending lessees are required to state in their proposals the royalty in fuel oil which they will offer for the privilege of the lease. This oil is to be delivered at such points on the Pacific Coast as the Secretary of the Navy may direct.

"The proposals are to be received either in San Francisco or in Washington, as the bidder may elect. Following are the instructions sent by Secretary Denby to Lieutenant Commander I. F. Landis, retired, U. S. N., San Francisco, Cal.:

"Sealed proposals will be received until noon April 25, 1921, at Room 217, Post Office Building, San Francisco, Cal., or at the Bureau of Engineering, Navy Department, Washington, D. C., for lease of a strip of land within Petroleum Naval Reserve No. 1, Kern County, Cal., along the north side of Sec. 1-31-24, M.D.M., and along the east side of the northeast quarter of said section, nine hundred feet wide, and to have drilled thereon twenty-two wells in two rows, properly and economically spaced, as rapidly as men, material and supplies therefor can be obtained. Bidders must furnish evidence of their ability to begin promptly and prosecute diligently the work of drilling and producing. Bids must state when work will be started and the time for drilling the first and each succeeding well; and the royalty that will be paid in crude oil delivered on the lease or the equivalent in fuel oil delivered at tidewater at the option of the Navy Department. Each proposal must be accompanied by a bond or a certified check in the sum of $10,000 as a guarantee that the bidder will, if his proposal is accepted, enter into contract, and furnish satisfactory bond for the fulfillment thereof. The right is reserved to reject any or all bids or to accept any bid, as the interests of the Government may require."

British Guiana Oil Possibilities

SPECIAL CORRESPONDENCE

D. Elliott Alves, president of the British Controlled Oil Fields, Ltd., according to reports received at Georgetown, Demerara, British Guiana, is to visit British Guiana to study local conditions.

Several years ago Mr. Alves obtained through the British Colonial Office a permit to explore all unoccupied Crown Lands in British Guiana for oil, and for the expenditure of a stated sum of money on exploration work he was to receive 2,000 square miles in concession. In January, 1919, Mr. Alves sent George E. Reynolds to the colony, with several assistant geologists. This expedition, after several months of general exploration, left for Trinidad without giving out any information. In April, 1920, a second expedition, in charge of B. T. Macrorie, arrived in British Guiana, and spent several months. When Mr. Macrorie left without starting any serious work, such as test borings, the general opinion prevailed that Mr. Alves had given up British Guiana as an unpromising field.

It is stated that Mr. Alves is to have an aerial survey made of his oil concessions in Venezuela, and that he has engaged the services of a company already operating in the West Indies to make a survey within six months, the sum to be paid being £12,000. The concessionaires are to supply boarding and lodging for the staff of the aerial fleet as well as fuel. It is hoped that this fleet will extend its operations to British Guiana.

Chamber of Commerce To Discuss Oil Resources

At the ninth annual meeting of the Chamber of Commerce of the United States to be held at Atlantic City, April 27 to 29, the question of "Our Government's Relation to Domestic and Foreign Oil Resources" will be discussed by leading business men from various sections of the country. The subject will come up for discussion before the group meeting of the chamber's department of natural resources production.

"The importance of this subject," says this department, "rests on the fact that certain foreign fields are closed to American exploitation. Our exclusion from those fields is viewed with concern by American business men since our own oil fields tend to exhaustion." The discussion will bring out some interesting arguments on the international oil situation.

Red River Boundary Settlement Deferred

SPECIAL CORRESPONDENCE

In the suit between Oklahoma and Texas over the Red River boundary, involving valuable oil lands, Oklahoma won the first point in the Supreme Court on April 11. The court decided unanimously, except that Associate Justice Clark took no part, that the south bank of the Red River must be taken as the true boundary between Texas and Oklahoma from the southeastern corner of Oklahoma to the point where the river crosses the 100th meridian of longitude.

The limitation of the exact location of the south bank was postponed until the entering of the formal decree. This will probably be within thirty days. The court based its finding on the terms of the treaty between the United States and Spain in 1819 regarding the Louisiana Purchase.

Book Reviews

Structural and Field Geology. By Jas. Geikie, LL.D. Fourth edition, revised. Cloth; 5½ x 8½; pp. 433. D. Van Nostrand Co., New York. Price, $7.50.

The textbook of geology by Professor Geikie was one of the stand-bys thirty years ago, along with those of Dana and Le Conte. The present volume, however—"Structural and Field Geology"—was issued in 1905. Since the death of Professor Geikie, it has been revised by Dr. Robert Campbell, of the University of Edinburgh.

After looking over this volume, we do not feel that we can recommend it to American readers. Its examples are drawn almost entirely from the United Kingdom, with a minor amount from Europe. Authorities, quoted very sparingly, are similarly selected. The nomenclature differs considerably from that which has been adopted in America, Canada, and also largely in Australia. We do not refer to an "outcrop" as an "outgoing"; few of us have any idea of what "cockade" ores are; we are not familiar with "calc-silicate hornfels" or "schorl"; the choice of "aplite or haplite" looks to us like a problem in dropping the "h's"; we spell felspar with a d. How many of our geologists know what "mylonites" are? As a clue, they are rocks—not fossils.

Moreover, the volume is plainly old fashioned, elementary, and too academic: it smacks too much of the lecture room and too little of the field. American students will do well to study Pirsson and Schuchert, or Chamberlain and Salisbury; and, for ore deposits, Kemp, Lindgren, or Emmons. We are almost tempted to give the same advice to English students; but there is some advantage for these in the citing of British and European examples.

The geology is curiously simplified and textbookized. Though the elementary student may acquire a knowledge of many useful geological facts, he will not get a real breath of the great out-of-doors; and the book is evidently not written for the advanced student. A number of chapters on geological surveying comprise obvious and simple matters that should be imparted in the classroom or the field, or gathered by experience.

The two chapters on ore deposits are not to be recommended: they remind one of all the old textbooks from Von Cotta down, with a faint aroma of the modern. Californians will be interested to know that the Mother Lode is probably the most persistent lode in the world, running straight for more than seventy miles, whereas some lodes die out in much less than a mile! (P. 246). Food for much thought, as regards "fissure veins or lodes," is given by the remark that "As vertical fissures of all kinds tend to die out upward, while the amount of displacement by faults diminishes in the same direction, we may infer that many fissures may never have reached the surface at the time of their infilling, the outcrops we now see having been exposed by denudation." (P. 247.)

We are interested to know that some veins have been followed to depths "not far short of 3,000 ft." Not so very far short. We pause to consider what "secretionary ore-formations" may be (p. 276), and when we have found out, maybe we had better forget it. Lateral secretion and Sandberger are among the latest news in these pages. Finally, we read again with excitement, as in our youth, of the evidence of foul play among the fishes in the copper slates at Mansfeld. These fish, according to the view—one of the views—cited, were "poisoned by an abundant influx of water charged with salts of copper. Certainly the fossil fish of the copper slate often occur in bent and contorted attitudes, as if they had suddenly been killed." An ancient geologic joke recites that the prehistoric fishes were caught by the prehistoric fissures; but this does not answer the problem of the wholesale extermination of the finny tribe at Mansfeld, by a method which so far as we know has always been illegal.

J. E. S.

Metal Statistics, 1921. Published by the American Metal Market, New York. Cloth; 4 x 6; pp. 560 inc. advts. Price, $1.

The edition of this book carrying statistical information concerning the ferrous and non-ferrous metals up to the close of 1920 has just been issued. Prices, production, consumption, and other data are given for iron, steel and fabricated products, copper, tin, lead, zinc, aluminum, antimony, nickel, silver, and miscellaneous ores and metals.

Recent Patents

Magnetic Separator—No. 1,371,825. Franz Uhlig, Berlin, Germany. A magnetic separator for removing tramp iron from a stream of falling ore, together with a receiver for catching the extracted articles.

Method of Depolarization—No. 1,371,826. G. D. Van Arsdale and C. G. Maier, New York, N. Y. The use of a soluble salt of a metal as a depolarizing agent and a method of regenerating it after it has been transformed at the electrode.

Vanadium for Making Sulphuric Acid—No. 1,371,004. Franz Slama and Hans Wolf, Ludwigshafen-on-the-Rhine, Germany, assignors to General Chemical Co., New York, N. Y. The use of vanadium compounds as catalytic agents in the manufacture of sulphuric acid.

Flotation—No. 1,370,843. R. E. Sayre, Pittsburgh, Pa., assignor to Metals Recovery Co., New York, N. Y. The use of a ketone condensation product as a flotation agent.

Technical Papers

Petroleum Concessions—An opinion by Hon. Manuel Calero, formerly Mexican Ambassador to the United States, on petroleum concessions in the "federal zones" in Mexico, is expressed in a memorandum to Frederic R. Kellogg (52 Broadway, New York) entitled "Petroleum Concessions in the 'Federal Zones' of Mexico." In his report regarding the validity of oil concessions granted by the Mexican government in the so-called "federal zones," Senor Calero states that they are illegal, basing his opinion on the following conclusions: In the greater number of cases property rights are violated because they refer to channels owned by private individuals as part of the tracts in which they are found; when these channels are not the property of individuals, such concessions violate private rights, because they extend to the banks which are always the property of the owners of the tracts running along the rivers; in any case, concessions violate private rights by being extended to the so-called "federal zones," because this term, speaking of waters of federal jurisdiction, involves only the imposition of an easement, of common use, which does not alter the basis of the right which the owner of the land has in respect of the land; and if the validity of the Constitution of 1917 and of the precept of Article 27, which declares the subsoil of the country to be the property of Mexico, is admitted, even so the concessions which have been considered are illegal, because they are issued without the adoption by the Mexican Congress of any law which carries into effect said Article 27.

Nickel in South Africa—In the *South African Mining and Engineering Journal* of Feb. 19, 1921 (Johannesburg, Transvaal; price 6d.), is published some of the particulars regarding the recent discovery of nickel deposits in the Barberton district. The metal occurs in the form of garnierite, the same as in New Caledonia, and the deposits promise to be so extensive and high grade that commercial development is being started. The South African Nickel and Talc Mines, Ltd., has been formed in Johannesburg to handle the proposition, and it is planned to ship the ore to Europe for treatment.

Canadian Mineral Production—Preliminary reports of the 1920 mineral production of Ontario, of Quebec, and of Canada as a whole have been issued. The value of mineral products for the Dominion exceeded any previous year. Copies of the bulletin may be had on application to the Department of Mines at Toronto, Quebec, and Ottawa, respectively.

Massachusetts Geology—Bulletin 704 of the U. S. Geological Survey, Washington, D. C., 132 pages, obtainable on request, describes the geology of igneous rocks of Essex County, Mass.

ECHOES FROM THE FRATERNITY

SOCIETIES, ADDRESSES, AND REPORTS

Hoover Tells A. E. C. of Needed Changes in Federal Machinery

Budget System Desirable, but Thorough Reorganization of Executive Departments Essential

The following summary presents the chief points made by Secretary Herbert Hoover in his last address as chairman of American Engineering Council at its session in Philadelphia on April 16:

There is one problem of the new Administration that has received the attention and thought of the organized engineers of America for many years past. This is the problem of the reorganization of the Federal Government. Government waste during the war amounted to millions.

Congress has placed the problem in the hands of an able Congressional joint committee, but if it is to succeed in securing the imminently necessary results it will only be by full insistent support by public opinion. Many previous attempts at reorganization have gone to the same crematory—the interminable differences in opinion among the executive and legislative officials over details.

One sweeping and fundamental necessity stands out above all others, and that is that the administrative units of the Government must be re-grouped so as to give each of the great departments more nearly a single purpose. Economies can be accomplished from a public point of view by an elimination of the overlap in the different units of administration through unification into groups of similar purpose. The real economy to the nation, however, does not lie here, however great this may be; it lies in their more effective functioning in their daily relation to the public.

Of equal importance with economy is it to secure effective concentration of Government effort into service to the community. No constructive vision or policies can be built around a national service directed by from two to ten Cabinet members, more especially when this particular purpose is a side issue to all of them. No better example of this exists than the deplorable handling of our relations to our veterans.

There are other reasons that render reorganization imperative. The changed economic situation of the world demands that the functions of the Government in aid to commerce and industry be given more concentration and wider scope.

The enlarged activities of the Government as a result of the war greatly affect certain departments. The Treasury today as the fiscal office of the Government must handle an annual budget of $5,000,000,000, as compared with $1,000,000,000 before the war. Activities of the Army have increased from a budget of $200,000,000 to $400,000,000; activities of the Navy have increased from a budget of $125,000,000 to $425,000,000. In the interests of efficiency the gentlemen conducting these departments should not be called to responsibility for the administration of at least some of the matters not pertinent to their major functions but which now clutter their departments.

We have also some confusion between executive, advisory, and semi-judicial functions. One of the tendencies of Government, both local and national, during the last twenty years has been to add executive functions to commissions and boards created primarily for advisory or regulatory purposes. It requires no argument to show our business public that the executive functions can not rise to high efficiency in the hands of Government boards, where, from the very nature of things, each member has a separate responsibility to the public and is primarily engaged in a semi-judicial function.

Furthermore, during the last few years there has been a great growth of independent agencies in the Government, reporting directly to the President, until his office is overburdened almost beyond the point of endurance. Not only do these outside functions today overburden the President, but they render co-ordination with executive departments extremely difficult. Much could be done to mitigate the situation.

One of the great steps in Federal reorganization is the erection of a budget system, but it will not serve its real purpose until the departments have been so reorganized that they represent a common purpose. Without this, Congress will never have before it budgets showing the expenditure of the Government in its relation to any particular function.

I have daily evidence in the Department of Commerce of all these forces. The economic changes in the world, growing out of the war, and their reflex upon our trade and industry, make it vital, if we are to maintain our standards of living against increasing ferocity of competition, that we concentrate and enlarge our national effort in the aid, protection, stimulation and perfection of our industrial and commercial life. There can be no real Department of Commerce or commercial policies to these broad purposes so long as the instrumentalities of the Government bearing on these questions lie in half a dozen departments.

We want no paternalism in Government. We do need in Government aids to business in a collective sense. In a department we do not want to either engage in business or to regulate business. We need a department that can give prompt and accurate diagnosis, from both foreign and domestic points of view, of economic events, of economic tendencies; of economic ills; that can promptly and accurately survey economic opportunity, economic discrimination and opposition; that can give scientific advice and assistance and stability to industry in furnishing it with prompt and accurate data upon production, supplies and consumption; that can co-operate with it in finding standards and simplifications; that can by broad study promote national conservation in industry and the elimination of waste; that can study and ventilate the commercial side of our power possibilities; that can study and advise national policies in development of rail, water, and overseas transportation; that, in fact, covers, so far as Government functions can cover, the broad commercial problems of trade, industry, and transportation. This can be accomplished more by co-ordination of existing governmental facilities than by increased expenditures.

Fairbanks Experiment Station Proves Its Value to Alaska Miners

Under the superintendency of John A. Davis, the experiment station maintained at Fairbanks, Alaska, by the U. S. Bureau of Mines is carrying out a number of studies along lines suggested by the existing needs and conditions of the distant isolated territory. Some of the results have recently been reported by the Bureau and may be summarized here.[1]

Investigations are mainly along two lines: the recovery of gold from black sands and the study of milling methods.

In the effort to devise a means of preventing waste, the Alaska station has experimented with various methods for recovering the gold.

These experiments have aroused a great deal of interest among the Alaska placer miners, many of whom are taking advantage of the results obtained, with a consequent greater saving of gold in their mining operations.

The Alaska station is also making a study of the ores and of the methods and processes employed at mines and concentrating plants in the district, together with laboratory tests of products obtained during their operation. Ordinarily the Bureau does no ore-testing work for the benefit of private companies or individuals.

[1] *Reports of Investigations*, U. S. Bureau of Mines, March, 1921, Serial No. 2,231.

MEN YOU SHOULD KNOW ABOUT

J. B. Tyrrell has returned to Toronto from a recent trip to Alberta and the West.

W. A. Nelson, state geologist of Tennessee, conferred with officials of the U. S. Geological Survey in Washington recently.

Jay A. Carpenter, consulting metallurgical engineer of Los Angeles, Cal., was in San Francisco, Cal., recently on his way to Ione, Nev.

George Hanson, of the Canadian Geological Survey, British Columbia branch, should be addressed at 510 Pacific Building, Vancouver, B. C.

George P. Tweed, of the firm of Coates & Tweed, Hibbing, Minn., has returned from a business trip to the large furnace towns of the East.

H. A. Buehler, director of the Missouri Bureau of Geology and Mines, was in Washington, D. C., recently, conferring with Government officials.

F. C. Thompson, Survey Research Fellow at the University of Sheffield, has been appointed professor of metallurgy at the University of Manchester.

A. H. Brooks, of the U. S. Geological Survey, recently spoke at the General Staff college of the army, on "The Application of Geology to the War."

J. S. S. Brame, professor of chemistry in the Royal Naval College, Greenwich, London, England, is president of the Institution of Petroleum Technologists for 1921-22.

W. C. Agnew, general manager of the Rogers-Brown Iron Mining Co. and the Mahoning Ore & Steel Co., has gone to Baltimore, Md.

Dr. F. H. Hatch, has been appointed advisor to the Mines Department of the Geological Survey of Great Britain, on questions relating to the metalliferous mining industry.

A. S. Eakle, professor of mineralogy in the University of California, at Berkeley, is in charge of that university's extension course in mineralogy conducted by correspondence.

R. H. Carr, vice-president of the Demerara Bauxite Co., Ltd., left Georgetown, Demerara, British Guiana, March 24, by the "Maraval" for New York. He is expected to return soon.

F. L. Ransome has completed a reconnaissance of the ore deposits in the Oatman district of Arizona for the U. S. Geological Survey. He was assisted in this work by **M. G. Gulley.**

J. J. Warren, president of the Consolidated Mining & Smelting Co., has returned to Montreal from a trip of inspection to the company's workings and plants in western Canada.

George W. Wooster, treasurer, and **G. L. McNichol,** purchasing agent for the Granby Consolidated Mining, Smelting & Power Co., have resigned after completing twenty-two years of service.

C. W. Cooke and Miss **Julia A. Gardner,** of the U. S. Geological Survey, are making a field examination of the Upper Eocene, Oligocene, and Miocene formations in Alabama, Florida, and Georgia.

G. M. Colvocoresses, general manager of Consolidated Arizona Smelting Co., and president of the Western Metallurgical Co., has just returned to Humboldt, Ariz., from a six-weeks' trip east.

William Spry, the new Commissioner of the General Land Office, is charged with the survey, management, and disposition of the public lands, the granting of railroad and other rights of way, and the execution of laws relating to surveying, prospecting, entering, and the like in national forests. His official duties thus bring him into contact with the land-classification board of the U. S. Geological Survey as well as with the officials of the U. S. Forest Service. Ex-Governor Spry has declared it as his firm conviction that the mining industry is entitled to more co-operation from the Federal Government than it has been receiving.

WILLIAM SPRY

Commissioner Spry was born at Windsor, England, in 1864, but came to the United States when eleven years old. His extensive business experience began when he was a general merchant in Salt Lake City, Utah, from 1891 to 1893, after which he took up farming and stock raising, with some success. From 1894 to 1896 he was also county collector of Tooele County, Utah. In the following years he was successively councilman of Grantsville, president of the Utah Board of Land Commissioners, and United States Marshall for Utah. In 1908 he resigned this last position and ran for Governor, was elected, and served two terms, from 1909 to 1917. He was appointed to his present position on March 17, 1921, and assumed office a few days later.

C. L. Nelson has been granted a year's leave of absence by the U. S. Geological Survey, to accept employment with the Sinclair Exploration Co. He has been assigned to work on the island of Timor, in the East Indies.

Robert McF. Doble has been appointed on the staff of the Metals Exploration Co. as consulting engineer on electric and hydro-electric power installations and operations. His headquarters are at 201 14th St., Denver, Col.

Frank H. Sistermans, mining engineer, has returned from a three months' trip to Mexico, where he investigated various mining properties for New York clients. His present address is Room 1505, 60 Broadway, New York City.

J. O. Elton, metallurgical engineer with the Anaconda Copper Mining Co., Great Falls, Mont., has received an honorary degree from the University of Idaho in recognition of his work in the hydrometallurgy of zinc. Mr. Elton is a graduate of that university.

Charles A. Mitke, consulting mining engineer of Bisbee, Ariz., was in New York City last week on his way to Cambridge, Mass. Mr. Mitke is to give a six weeks' course of lectures on mining methods to classes in mining at the Massachusetts Institute of Technology.

Key Pittman, senior Senator from Nevada, has been making a short trip through some of the principal mining districts of his state, with the object of personally assuring the residents and operators that he firmly believes in the practical impossibility of the repeal of the Pittman Act.

Engineers recently engaged by the Guiana Development Co. for its mining operations on the Marowine River, French Guiana, include **R. Sargent, G. E. Mish, W. Piel, C. Apfel, W. C. Norton, James Bowe,** and **A. Box.** They sailed from Georgetown, Demerara, on March 24, by the "Kon. Wilhelmina" (D. G. S.) for Paramaribo, en route to Surinam.

Colin G. Fink, electrometallurgist, organizer, and for the last four years director of the research laboratory of the Chile Exploration Co., New York City, has resigned that position. Dr. Fink recently developed a new tin reduction and refining process, and his insoluble anode is being introduced at the Chuquicamata, Chile, copper refinery. He has opened a consulting engineering office in South Yonkers, N. Y.

SOCIETY MEETINGS ANNOUNCED

The Arizona Chapter of American Mining Congress will meet at Bisbee, Ariz., on June 13. J. E. Curry, Bisbee, Ariz., is secretary.

The Chamber of Commerce of the United States holds its ninth annual session on April 27, 28, and 29, at Atlantic City, N. J.

Mining Men of Pacific Northwest Meet Again In Portland

Second Convention of Season Follows Soon After That at Spokane — Nelson Selected for Next Gathering — Address By Edwin Ludlow, President of A. I. M. E., Features Occasion

BY ROBERT DUNN
Written for *Engineering and Mining Journal*

THE question of raising the tariff on imported metals, the problem of production and distribution of coal, the encouraging of the prospector, and generally the fostering of the mining industry of the Northwest were considered by the International Mining Convention held in Portland, Ore., April 5 to 9. More than 600 delegates from Washington, Idaho, Montana, California, Alaska and British Columbia were present. Exceptionally fine weather marked the days of the convention and the time that was not spent in the transaction of business was spent by the visitors in the enjoyment of the entertainment features provided. Nelson, B. C., was selected for the next International Convention.

The delegates were welcomed by Governor Ben W. Olcott, of Oregon, and Mayor George L. Baker, of Portland. Responses were made by delegates from the various sections of the Northwest already named. Perhaps the most notable address of the day was that of Marshal N. Dana, of the *Oregon Journal*, who dealt in general terms with the basic industries of the Northwest.

Wednesday was given up entirely to consideration of the coal resources of the Pacific Northwest, to methods of mining coal, its preparation and its distribution. The first paper was that of George W. Evans, of Seattle, who dealt with the geology and coal resources of Washington and Oregon with brief reference to the coal fields of other sections of the Northwest. Mr. Evans' address was followed by a paper presented by S. H. Green, manager of the Pacific Coast Coal Co., of Washington. E. R. McMillan spoke on the preparation of coal. This was followed in the afternoon by two interesting papers, one by Ralph Gault, a fuel engineer, on the utilization of coal, including hand firing, automatic stokers, and carbonization, with special reference to powdered coal for steam generating. A. W. Perley, of the Oregon-Washington Railroad & Navigation Co., then opened a discussion on the locomotive fuels of the Northwest. A paper that may be mentioned in this connection but which was delivered later was one on the low temperature distillation of coal, by Kirby Thomas, of New York. There was marked unanimity of opinion as to the desirability of abandoning present wasteful methods in burning coal. The solution accepted seemed to be to treat coal by low temperature distillation methods and to recover the byproducts.

This discussion was entered by Edwin Ludlow, president of the A. I. M. E., who spoke of a good coking coal as being essential to the success of an iron and steel industry. To get this industry the West's only problem was that of obtaining the required metallurgical coke. Develop such an industry in the coal fields of Washington and Utah and the rest would follow. There seemed to be no lack of iron ore, especially when the magnetites of British Columbia and the proximity of the resources of Mexico and of the Orient were borne in mind. Nichol Thompson, of Vancouver, dealt with the magnetites of British Columbia, with the fine coking qualities of the coal of the Crow's Nest Pass district and with the high-grade metallurgical coke which has been produced from the coals of Vancouver Island.

PRESIDENT OF A. I. M. E. ADDRESSES CONVENTION

British Columbia day, April 7, was opened with Dr. Edwin T. Hodge in the chair. An address was delivered by Mr. Ludlow on "The Mining Industry in Relation to Business." The inhabitants of this country, he said, are directly dependent on the products of agriculture as well as of copper, lead and coal. The products of farms as well as of mines of America must find a market at a price higher than the cost of production. He traced the commercial history of the last few years, pointing out that the United States had been a heavy exporter with the balance of trade very markedly in its favor. Under present conditions if trade was to be maintained it must be based on barter rather than credit. Europe owes the United States fifteen billion dollars. Never before had a depression been experienced in this country at a time when the nations of Europe were not financially able to take advantage of the fall in the value of American securities during such periods to purchase the same in large quantities. Local production had been keyed up by war efforts far beyond the local power of consumption. There also was to be considered a very serious adverse factor; namely, the matter of exchange. This might be simply explained by the statement that a South American merchant with $10,000 in United States currency to invest would be able to purchase $13,000 worth of goods in England, more in France, and $20,000 worth in Germany. The condition was further aggravated by the prevalence in the United States of a "buyer's strike."

In Europe cotton, wheat, copper and coal were badly needed, said Mr. Ludlow, but could not be obtained from America unless the trade was based on barter rather than credit. This brought up the question of the tariff and whether a tariff wall will be built around this country "to protect the manufacturing interests, rendering it impossible to extend that assistance which is needed, not only to the majority of our people, but to the war-ridden nations of Europe, who have nothing but the work of their hands with which to pay for the raw material needed." It is hoped, continued Mr. Ludlow, that they (Congress) will examine carefully the question whether the manufacturers who are demanding this protection have done their share toward reducing the cost of living. Copper, lead, zinc and the products of the farm already are selling not only below 1914 prices, but below the cost of production and coal is arriving at this point. Mr. Ludlow concluded by sounding a solemn note of warning. Mining and agriculture were basic industries, he said, and their future should be based solidly on good business principles and not on the protection of favored industries. If the tariff wall were built for the protection of the products of the mines and farms the production of those industries must be reduced to meet the needs of America alone. In the war of the survival of the fittest that would follow railroad rates would handicap the industrial advance of the West. Many of the higher cost mining projects would be closed down and, besides, the industrial recovery of Europe would be immeasurably delayed.

WILLIAM SLOAN DISCUSSES MINING IN BRITISH COLUMBIA

Nichol Thompson presided in the afternoon and introduced William Sloan, Minister of Mines for British Columbia. Mr. Sloan referred to the international character of the gathering and the manifold evidences of good fellowship and thorough understanding between the American and Canadian delegates. He extended an invitation to the former to visit British Columbia, not because the Provincial Government had just concluded the passage of a liquor control act, but because the Canadians would like to have their cousins with them and because he believed in the axiom that "neighborli-

ness is both sound Christianity and good business." He gave the production of British Columbia in mineral values from 1852 to the end of 1920 as $705,230,519. After outlining results of mining operations during 1920 he pointed out that British Columbia's advance in volume of mineral production had been steady during the past twelve years, in which respect it compared more than favorably with the records of most of the large mineral producing states. He touched on developments of the Salmon River section, in the Portland Canal district; on the progress made in the Alice Arm district, but emphasized that, in considering the silver camps of his province, the Slocan and other sections of the Kootenay districts should not be overlooked, as they still furnish the greater part of the silver production of British Columbia. He enumerated what the government of the province has done to stimulate interest in the mining industry, pointing out that among other things there had been constructed and maintained since 1917 3,901 miles of mining roads and trails. He spoke, too, of the institution of series of lectures by the mining engineers in their various districts for the benefit of prospectors and small operators, and also drew attention to the fact that an appropriation had been made for the purchase of powder for distribution at cost among the bona-fide mineral prospectors of the province. Mr. Sloan added "With regard to capital, so essential for continued and increased development, we realize that capital must have a legitimate return, and to that end our mining laws are founded on stability and are recognized throughout this continent as fair and equitable. This also it may be stated is our policy with regard to the important question of taxation."

The Prospector Receives Due Attention

"The Problems of the Prospector" was a subject very entertainingly handled by J. W. Mulholland, president of the British Columbia Prospectors' Protective Association, of Nelson, B. C. He commended the government of the province for the various steps taken to encourage the prospector in his search for mineral, but declared that the real old "sour dough" was now but very seldom found. He soon would be as extinct as the dodo. Mr. Mulholland gave various explanations, chief among which was that the pioneering efforts and the genuine worth of the prospector had not been recognized. He thought that the merchants and the business men would be well advised to heed more often the prospectors' request for grub stakes. The day was when the prospector had no difficulty in finding necessary financial support, but that day had passed.

S. S. Fowler dealt with the "Mining Industry of Southeastern British Columbia." By means of a map Mr. Fowler illustrated the country whose mining industry he outlined.

A paper was read by Robert N. Bell, formerly state mine inspector of Idaho, on "Potential Copper, Gold and Silver Resources and Transportation Advantages of the Snake River Canyon." Mr. Bell enumerated some of the recent important mining developments in his state and expressed the opinion that the construction of a railroad to the Coast by way of Snake River Canyon would mean much not only to the mining industry of Idaho but to the development of business in Oregon as well.

T. A. Rickard and Sidney Norman Speak

An evening session was marked by two papers, one contributed by T. A. Rickard, of San Francisco, on "Prospecting, Past and Future," and the other by Sidney Norman, of Spokane, on "Protection for the Promotor." Mr. Rickard referred to the many accidental discoveries of important mineral deposits in the past and then went on to deal with the scientific process of prospecting. As instances of the latter he called to mind the persistence of the search of James S. Douglas in sinking a deep shaft on the United Verde Extension, even after a first disappointment; also to the opening of the Suan concession in Korea by British and American engineers. In referring to proposed easy ways of locating ore underground he spoke of "the divining rod," the "magnetic needle to find masses of iron ore," "the method of measurement of electric resistance whereby the resistance of the earth circuit between two points is measured in order to detect abnormalities that point to the presence of orebodies," and "the telephonic method," in which the passage of electric currents in the earth is observed, etc.

He continued: "The hazel twig as a means of divination may yet have as its successor some accurate method of finding ore; the alchemy of one age is the chemistry of another. I am quite prepared to believe that honest scientific investigation will succeed in devising a way of obtaining guidance for the miner in his prospecting by detecting and measuring the emanations, resistances and other intangible reactions of matter on matter in such a way as to indicate not only qualitively but quantitively the presence of ore at a distance underground. Meanwhile it remains for the prospector to use the methods on which he can rely rather than allow himself to waste time and break his heart on schemes that are either inchoate or fraudulent. The core drill and diamond bit are well tried tools; the shaft and the prospect hole will not deceive. After all, the best instrument of divination is the pick. There is intelligent curiosity in the point of it; there is strength in the handle of it; there is rhythm in the swing of it."

Mr. Norman spoke very strongly regarding the ill effects of blue sky legislation now in force in about thirty states of the Union. He went into the subject very exhaustively and maintained that the small promotor who is responsible for so much of the mining development of the past is being driven out of the business. Illustrations were given to point out the absurdity of some of the methods adopted in some states in connection with the enforcement of this legislation. It was his argument that if this legislation continued as at present it would mean the strangulation to a large extent of mining development. He advocated that if blue sky legislation were at all necessary it should be unified in its application to the United States, its administration being placed in the hands of a Federal board.

This matter was the subject of much discussion the next day, the outcome of which was the passage of a resolution endorsing the principle advocated by Mr. Norman and calling upon those in authority to take concerted action.

Convention Against Increased Tariff on Lead and Zinc

Some resolutions passed by the convention may be summarized as follows:

That immediate steps be taken by carriers or producers and shippers jointly to secure such readjustment of the present ore and bullion rates as will permit of continued operation of metal mines, and at the same time give to the carrier a just and reasonable compensation for the service rendered by it.

That the Federal Trade Commission be requested to make an immediate investigation of the affairs of the so-called "Powder Trust," and the attention of Congress is respectfully invited to consider its exactions, with a view to bringing the price of explosives down to a level justified by present conditions, thus aiding materially in restoring prosperity to the mining industry and reducing the cost of the great highway building campaign being carried out in the Western States.

That the homestead grazing act, providing for entry to the extent of 640-acre lots, is detrimental to the mining industry, opening the way for unscrupulous individuals to make entries and hinder legitimate development of the mining industry, and that this act be immediately repealed.

A more or less persistent effort was made to have the International Convention put itself on record as being in favor of a considerably increased tariff on lead and zinc imported to this country. This movement was initiated particularly by the delegates from Idaho. A meeting of the American delegates was called especially to consider the question. Strong opposition to the convention putting itself on record developed, and the matter was dropped.

An Oregon section of the American Institute of Mining and Metallurgical Engineers was formed during the convention, a very enjoyable "get-together" dinner being held for that purpose. Officers were elected as follows: Henry M. Parks, president; M. Bailey, vice-president, and F. S. Cook, secretary-treasurer.

THE MINING NEWS

LEADING EVENTS

Walkout at Tonopah and Divide Following Wage Cut

Crafts Object, Claiming Living Cost Has Not Decreased 25 Per Cent —West End, Halifax and Cash Boy Running

Mine and mill workers in the Tonopah and Divide districts of Nevada walked out on April 16, the day when a wage cut of 75c. per shift, announced on April 11, was to become effective. On the earlier date a majority of the operators of the district had posted a notice of this reduction and there was very little discussion among the miners. This reduction brings wages of miners and muckers to $5.25 and $4.75 per day respectively, hoist engineers $5.75, blacksmiths $5.75, machinists $5.75, and mill men $4.75 to $5.25.

Reasons for the reduction were that wages are higher in the district than in any other camp in the state, and probably in the West, with the possible exception of isolated districts; that the ores of these districts are getting lower in grade, making it increasingly difficult to operate at a profit in spite of the advanced price of silver; and that the drop in the cost of living justifies a corresponding drop in the wages. The drop in the cost of living, the operators claim, has amounted to at least 25 per cent in the past year, the drop being aided very materially by the successful operation of the Mine Workers Mercantile Co., an organization financed by the mining companies, which is running one of the most modern and up to date retail and wholesale stores in the state, selling practically at cost.

The crafts met, however, and made public objection to the reduction on the basis that living costs had not been reduced 25 per cent during the last year, although operators claim that they have. On the 16th the walkout was complete at all mines and mills where the reduction notices were posted. The only mines operating normally in the Tonopah district are the West End, Halifax and the Cash Boy. At Divide operations are practically discontinued.

Iron Ore Taxation Bill Signed in Minnesota

The Occupational Tax Bill, taxing mining in Minnesota, passed the state senate by a vote of 38 to 27 and was signed by Governor Preus on April 11. The bill provides for a 6 per cent occupational tax on ores mined in the state and will yield approximately $4,500,000 in revenue. As signed the bill is nothing more or less than a tonnage tax with the word "Occupational" added.

WEEKLY RÉSUMÉ

The iron-ore shipping season opened on the Great Lakes on April 11, but few boats are reported to be moving. Ore prices for 1921 are not yet fixed, and operators are said to be anxious. The U. S. Steel Corporation's act in cutting the price of its products, it is hoped, will stimulate trade. In Minnesota the iron-ore taxation measure has been signed. In Nevada, announcement of a 75-c. cut in wages at Tonopah and Divide was followed by a walkout. The Jackling group of porphyries has also announced a 20-per cent cut in salaries. The Silversmith mine, at Sandon, B. C., has shut down indefinitely. The Hecla, at Wallace, Idaho, has decided to remain open. Calumet & Arizona will cease all production of ore and copper at once. On the other hand, conditions in the gold camp of Porcupine, Ont., are said to be the best in six years, and things are flourishing. A reduction in freight rates on ores of certain grades at Pioche, Nev., has been authorized for a limited period. The Seneca Mining Co., at Calumet, Mich., has started its first stope.

In Manitoba the Flin Flon property has been taken under option by the Mining Corporation of Canada, it is said, and $350,000 paid. In Louisiana, Calcasieu Parish is reported to have agreed to a compromise in the Union Sulphur Co. suit over assessed valuation. On April 11 the U. S. Supreme Court handed down a supplemental decision of minor importance in the Conkling-Silver King Coalition case, favoring the latter.

At Washington Secretary Hoover has announced his intention of making a survey of the world's zinc markets. The bill providing for the appointment of a Federal Coal Commissioner has again been introduced. The Senate has once more received H. Foster Bain's nomination as head of the Bureau of Mines.

Porphyries To Cut Salaries 20 Per Cent May 1

Salaries of officials and employees of the "porphyry" group of copper companies, including Ray, Chino, Nevada Consolidated and Utah Copper, are to be cut 20 per cent on May 1. This reduction will apply to those who are on other than a daily basis provided the rates do not go below pre-war levels.

Hoover Resigns as Head of Engineering Council

Herbert Hoover resigned as the head of American Engineering Council at a meeting of that body in Philadelphia on April 16. Mr. Hoover took the ground that as Secretary of Commerce he could not continue to hold the position.

Flin Flon Now Under Option to Mining Corporation

Owners Said To Have Received $350,000 in Form of Unsecured Loan

The Mining Corporation of Canada has taken an option on the Flin Flon property in northern Manitoba. The price is the same as that which Col. William Boyce Thompson and associates had, the latter's option having expired with the end of March, as stated in *Engineering and Mining Journal* of April 9. The Mining Corporation is reported to have already paid $350,000. It is said that the understanding is that if they are unable to finance the proposition and should fall down on the deal, the $350,000 would be returned to them at any future time that the property is sold. This payment of $350,000, it is said, really represents an unsecured loan to the owners of the property.

Union Sulphur Would Compromise Tax Dispute With Parish

Reported Latter Has Accepted Offer—Seemingly No Dispute Over Valuation of Plant and Equipment

In the dispute over assessed valuation between the Union Sulphur Co. and Calcasieu Parish, Louisiana, the sulphur company has offered to compromise with the parish on the following terms: That the company will pay the taxes for 1919 on the full levied assessment of $31,039,395, plus certain attorneys' fees, interest, etc.; that the assessment for 1920 be based upon a valuation of $3.417 per ton on the 4,009,394 tons estimated remaining in the mine, and that the 892,945 net tons in stock piles (1,042,945 tons gross less 150,000 tons for permanent bases of bins) be valued at the market price f.o.b. mine; that proper tonnage-depletion deductions be made from each future year's assessment, and that the deduction of 150,000 tons from stock piles be a permanent one from year to year. Apparently there is no dispute over the valuation that has been placed on the plant and equipment.

The figures of the agreement in full indicate that the sulphur tonnage reserve in the mine Jan. 1, 1920, was 4,009,394; that the production during 1919 was 526,250 tons and during 1920 was 37,635 tons; and that the gross stock of sulphur on hand Jan. 1, 1920, was 1,042,945 tons valued at $15 per ton, and Jan. 1, 1921, was 271,049 tons valued at $13.50 per ton.

Later advice from Lake Charles, La., indicates that the parish has agreed to the terms of the compromise. This, however, has not been verified.

Utah Engineering Council Holds First Dinner

Sidney J. Jennings Suggests International Council To Regulate Conditions of Silver Production

The Utah Engineering Council, recently formed to bring about the affiliation of engineering societies functioning in the state, held its first dinner in Salt Lake City at the Hotel Utah, on the evening of April 11. There were 400 to 500 engineers and their friends present. The central theme of the speeches of the evening was the use which could be made in modern society of the creative power and experience of the engineer. The newly-elected Governor of the state, Governor Mabey, was present, and gave an address on "The Engineer and the Commonwealth." Clarence Neslen, Mayor of Salt Lake City, also spoke.

The aims of the organization were discussed by Hylon T. Plumb, who introduced Lafayette Hanchett as toastmaster. Sidney J. Jennings, of the United States Smelting Co., was present as a guest of the Utah section of the A. I. M. E. Mr. Jennings spoke on the Pittman Act and its importance to mining, stating it to be his belief that the silver mines of the nation could not operate without the execution of the provisions of this measure. Mr. Jennings urged, furthermore, that mining men co-operate to have the conditions of silver production, as regarding price especially, regulated by an international council.

Other speakers were: Prof. R. R. Lyman, who spoke on the "Value of Technical Training," and W. R. Armstrong, chief engineer for the Oregon Short Line Railroad, who gave a description of pioneer railroad building, asserting that the same qualities needed a few decades ago for accomplishment are equally necessary, if not more so, to solve present-day transportation problems. Rev. J. Sherman Wallace was also on the list of the speakers of the evening.

Montana Society of Engineers Meets at Anaconda

Members of the Montana Society of Engineers held their 34th annual meeting at Anaconda April 7, 8 and 9. Sight-seeing trips were made through the various departments of the Washoe Reduction Works of the Anaconda Copper Mining Co.

George T. McGee, of Helena, was named president of the society. Other officers elected were: Chauncey L. Berrien, Butte, first vice-president; Leon D. Conkling, Bozeman, second vice-president; Earl B. Young, Butte, secretary and librarian; Harry H. Cochane, Butte, treasurer; Charles H. Clapp, Butte, and Frank A. Linforth, trustees for three-year term. C. A. Lemmon the retiring president, in his annual address reviewed the progress of oil development as well as that of highway construction in Montana.

Court Gives Coalition Company Extra-Lateral Rights in Conkling Claim

By a further decision of the U. S. Supreme Court in the litigation between the Conkling Mining Co. and the Silver King Coalition Mines Co., of Park City, Utah, rendered April 11, the Silver King Coalition has extra-lateral rights in the Conkling claim of the Conkling company as well as ownership to a strip of ground in dispute between the two companies, and awarded the Silver King Coalition Feb. 28 by a decision of the same court. The later decision is rather of technical than of vital interest, as most of a large body of ore mined by the Coalition and also claimed by the Conkling company came from the disputed strip of ground, and not from the Conkling claim proper. The length of the Conkling claim, it will be remembered, as given in the patent did not agree with the length as indicated by the location posts, and by survey; and the strip of ground comprising the difference fell by the decision of the court to the Coalition. The decision of April 11 conceding apex rights to the Coalition in the Conkling claim settles the ownership of about $20,000 worth of ore, which is given to the Coalition by virtue of its apex rights on the Crescent fissure. The decision of April 11 is of interest in that it holds that a vein (here the Crescent fissure), which crosses through the sidelines of some of the Coalition claims, has extra-lateral rights in the direction of these sidelines produced, which in this case have become the endlines, that is—it places a liberal interpretation in regard to the locator's intention with reference to the strike of the vein, in that the locator may not always guess correctly as to the direction of the strike of the vein and locate his claim along it but across it, as happened here. The Supreme Court held that because the discoverer has not claimed as long a portion of the strike as he might have, he should not be deprived of even his diminished lateral rights.

Apache Powder Plant Expected To Be Complete in September

Three hundred men are employed in construction work on the plant of the Apache Powder Co., nine miles south of Benson, Ariz. Completion is expected in September. It is understood that the larger mining corporations of the Southwest are interested in the enterprise, which is being managed by Charles E. Mills, former general manager of the Inspiration Consolidated at Miami.

The Phelps Dodge Corporation has purchased the "Skeet" Jones nitrate properties in the Peloncillo Mountains. It is understood that this property was purchased with an idea of using the products in the manufacture of explosives at the Apache plant. A road is being built to connect the property with a side track on the E. P. & S. W. railroad.

Lake Ore Shipping Season Opened

Few Boats Moving in Contrast With Former Years—1921 Ore Prices Not Set Yet; Operators Uneasy

The 1921 ore season has been opened on the Great Lakes, the steamer "Frank Billings," of the Hutchinson line, having left one of the Duluth docks on April 11 with a cargo of iron ore consigned to the McKinney Steel Co., Cleveland. Although navigation has been opened for over a week there are but few ore vessels moving and it is unlikely that very much shipping will be done until after May 1. The fleet of the Pittsburg Steamship Co., which carries the ore of the Steel Corporation, will not start until that date. There was no string of ore carriers waiting at the Soo this spring to get through to Lake Superior and only a few carriers have left for the ore docks on Lake Superior. Ore prices for 1921 have not been set as yet, but it is believed that some action will be taken about May 1. The operators are very uneasy as they do not know whether they are going to move thousands or millions of tons this year. The decision of the Steel Corporation to reduce its prices was very well received throughout the Lake district, as it is thought that this will have a good effect on the ore market. Several more underground mines have been closed.

Non-Corrosive Steel Discovered in Krupp Laboratories

From Our Berlin Correspondent

After years of experiments in the laboratories of Krupp's, the latter firm has succeeded in producing a steel alloy which is claimed to be non-corrosive. It contains over 70 per cent of iron, its other components being chromium, and in a lesser degree, nickel. The alloy is made in three different varieties. The first resembles silver in chemical qualities, but has inferior mechanical qualities. It is recommended for medical instruments, turbine blades, valves, and the like. It is said to be immune against water and nitric acid, but not against sulphuric and muriatic acid. It is marketed at a price of 75 marks per kg. A second variety offers non-corrosiveness in a lesser degree, but is more ductile and malleable. As regards immunity against the chemical action of water, it is claimed to be superior to all existing steel alloys. A third brand, still more compromising between non-corrosiveness and mechanical qualities, is made for being used in cutlery manufacture, and the like.

Aluminum Company Must Sell Stock

The Aluminum Co. of America has been ordered to dispose of its stock in the Aluminum Rolling Mill Co., of Cleveland, Ohio, within one year, by the Federal Trade Commission. The commission found that the company's methods created a monopoly in sheet aluminum.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Secretary Fall Mum on Subject of War Minerals Relief

Only Five Claims Awaiting Decision—Commissioners Uncertain as to Further Duties

The new Secretary of the Interior has made no announcement of policy with regard to the War Minerals Relief Commission. Pending such an announcement, members of that commission are uncertain as to when they may be relieved from their duties. Senator Shafroth, the chairman of the commission, has planned to sail for Europe within a month. Philip N. Moore, another of the commissioners, has made arrangements to begin active work in his St. Louis office about May 15.

As this is written, decisions are pending on only five claims. There are still pending numerous matters connected with claims in which awards have been made, but matters of that kind, it is believed, can be handled by the chief engineer, who necessarily must remain with the work for some time to come. It is within the range of possibility, however, that Secretary Fall may disagree with the findings of the last administration with regard to the "request and demand" feature of the War Minerals Relief Act. If he were to request the new Attorney General to render an opinion, and if that opinion were to be at variance with the one issued by Attorney General Palmer, it would mean that several hundred cases would have to be reopened. In that event, the commission's work would be extended.

Senate Gets Bain's Nomination

The nomination of Dr. H. Foster Bain to be director of the U. S. Bureau of Mines was sent to the Senate by President Harding on April 16. At the time of this writing, the nomination has not been confirmed, but as no objection to Dr. Bain has been indicated by any member of the Senate, it is probable that his nomination will be confirmed in due course.

Legislative Transmutation of Non-Metals Into Metals "Riles" Engineers

The action of Congress in legislating non-metalliferous minerals into the metalliferous class is coming in for sharp criticism. This action was taken in the recently enacted Indian Appropriation law, in which magnesite, gypsum, limestone and asbestos are to be regarded as metalliferous for the purposes of that act. This provision is thought to have been slipped into the bill for the sole purpose of opening to entry certain asbestos deposits within Indian reservations.

Sentiment very generally favors the exploitation of mineral deposits, but mining engineers in different sections of the country are protesting against any effort to make black into white by legislative process.

Harding and Fall May Visit Alaska This Summer

Tentative plans have been made by the President and by the Secretary of the Interior to visit Alaska this summer. As such a trip is contingent upon circumstances that may arise regret is expressed that the plan should have been announced at this time. If conditions should arise which will prevent President Harding from making the trip it is probable that Secretary Fall's plans will be carried through.

House Committee on Mines and Mining Selected

Selection of the membership of the Committee on Mines and Mining in the House of Representatives during the 67th Congress, just beginning, was completed April 18. The Republican members of the committee are as follows: Marion E. Rhodes, Missouri, chairman; Leonard S. Echols, West Virginia; John M. Robsion, Kentucky; Edwin D. Brooks, Illinois; Oscar R. Luhring, Indiana; Charles R. Connell, Pennsylvania; Samuel S. Arentz, Nevada; William Williamson, South Dakota; Don B. Colton, Utah; Dan A. Sutherland, Alaska.

The Democratic members are Otis Wingo, Arkansas; Lilius B. Rainey, Alabama; George K. Favrot, Louisiana; F. B. Swank, Oklahoma. Meyer London, the Socialist member of Congress, also is assigned to the Mines Committee.

Zinc Markets of the World To Be Surveyed

After conferring with a number of the representatives of the zinc industry, the Secretary of Commerce has undertaken, in co-operation with the industry, a survey of the zinc markets of the world. Those who conferred with Secretary Hoover were: H. W. Lohman, United Zinc Smelting Corporation; E. H. Wolff, Illinois Zinc Co.; E. R. Grasselli, Grasselli Chemical Co.; Wade A. Taylor, American Zinc Producing Co.; Charles W. Baker, American Zinc Lead & Smelting Co.; H. V. Pretzel, American Metal Co.; John A. McCarthy, Anaconda Copper Mining Co.; William A. Ogg, American Zinc, Lead & Smelting Co.; S. M. Evans, Eagle Picher Lead Co., and S. S. Tuthill, of the American Zinc Institute.

Coal Commissioner Bill Again Introduced

George Otis Smith Said To Be Opposed—Prefers First To Try Publicity Without Regulation

Senator Frelinghuysen has reintroduced his Federal Coal Commissioner bill, revised so as to vest in the Director of the U. S. Geological Survey the duties prescribed for the coal commissioner. The bill provides that, in addition to the $6,000 now received by the Director of the Survey, he is to be paid $5,000 as coal commissioner.

Dr. George Otis Smith, director of the U. S. Geological Survey, is understood not to be in accord with the proposal. He has stated that, in his opinion, fact-finding and administrative functions should be vested in separate agencies. It is his belief that the powers conferred in the Frelinghuysen bill should head up in the Secretary of the Interior. Some of the duties then could be assigned to the Bureau of Mines, some to the Geological Survey and the regulatory features of the measure could be handled through a special assistant to the Secretary or some other agency entirely removed from the bureaus undertaking to ascertain facts.

Dr. Smith told the LaFollette committee during its hearing that he believes regulation of the coal industry along public utility lines is certain to come. In his opinion, this is practicable and is fundamentally sound, not only from an economic viewpoint but with due concern for the equities of all affected. Nevertheless he states very positively that no such regulations should be undertaken until publicity, without regulation, will have been tried out to see if it may not accomplish the results hoped for in the operation of a more or less drastic form of Federal control.

The Frelinghuysen bill provides for a searching investigation covering "the organization, management and practices of dealers and operators, costs and profits in connection with the mining, sale and distribution of coal, the terms contained in leases of coal mines, the prices demanded or received for coal, the distribution, storage, and sale of coal and the methods and processes employed therein, the consumption of coal and the transportation of coal in commerce, including the distribution of coal cars." While the measure is far less drastic than that proposed by Senator Calder, the purport of the bill with its power to subpœna and to enforce penalties is of the type calculated to stir up friction and animosities. Were all the powers lodged in the Geological Survey, it is believed that that Bureau soon would be in disfavor with industry, as is the Federal Trade Commission.

NEWS BY MINING DISTRICTS

Special London Letter

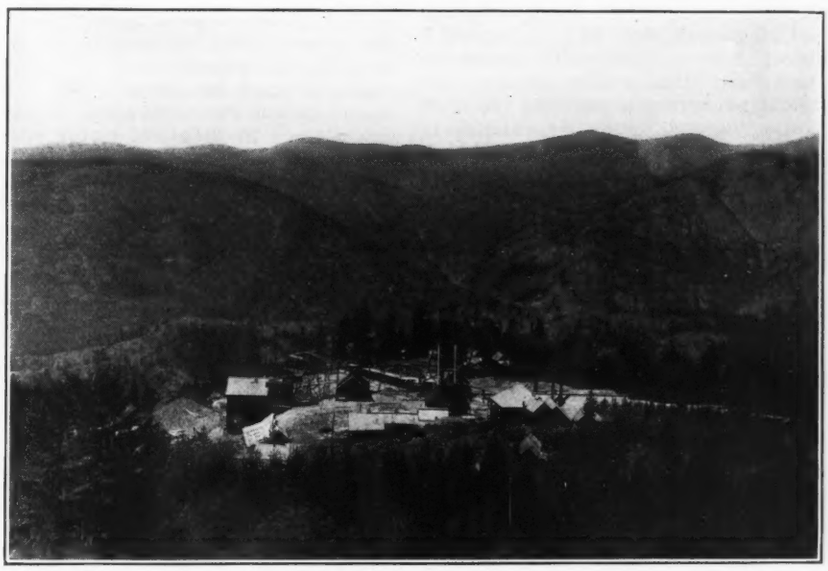
South Crofty Only Cornish Tin Mine To Earn Profit—West Springs on Rand Cuts Reef, Finding Great Width Running 2.04 Dwt. —East Rand Prop. in Bad Position

BY W. A. DOMAN

London, April 5—The only tin mining company in Cornwall to make a profit last year was the South Crofty, and it had the unusual experience of raising the surplus of £3,489 for 1919 to £7,563. It is nothing to boast about so far as actual amount is concerned; it is the fact that with the low prices ruling for metals a profit was earned at all. Tin realized an average of nearly £180 per ton and arsenic approximately £65, the averages for 1919 being £140 and just over £52 respectively. Costs necessarily advanced, the chief item being that of coal. As I have previously reported, the mine, like all others in the Duchy, is now closed down, only pumping being in progress. The question of keeping the mine free of water is a vital one. In fact neighboring properties are affected and for a considerable time the matter of a joint pumping scheme has been discussed. The South Crofty management cannot agree with the proposals of the East Pool and Agar board. It appears that on a former occasion the South Crofty put forward a proposal under which the East Pool should share expenses. The latter refused, preferring to take measures underground to preserve their own property. Now the East Pool finds pumping essential and the expense heavy and desires the South Crofty to take part in a scheme. This the South Crofty refuses to do, and suggests that at the back of the proposal is amalgamation which it would only join if its manager were appointed to a similar position in the merger. The matter is still under discussion.

In the West Springs mine on the Far Eastern Rand the No. 1 shaft has intersected the reef at a depth of 3,890 ft., the width being 8 ft. 4 in. This is exceptional for the district, and as no one expected great width to be accompanied by high values there was no disappointment when as the result of assaying 213 samples only 2 04 dwt. was shown. The mine is being opened up from the workings of the Springs Mines, and some fair grade ore has been disclosed. The West Springs is a large property and is at present only scratched. It is the experience in this part of the gold field that only from one-third to one-half of the area contains reef that can be profitably worked.

Regarded a few years ago as an investment for the capital of widows and orphans the East Rand Proprietary Mines is now looking very ragged. In fact the consulting engineer in his report for 1920 says the position is unsatisfactory in the extreme. It was only saved by the price realized for gold, the "premium" having been no less than £537,000 or nearly 25 per cent of the total income. Working costs required an extra dwt. per ton to cover them, i.e. 27/7 against 23/6. The result is that despite the gold premium the total profit was only £192,994 in comparison with £303,816. A comprehensive development program has been followed with, however, but little success. Taking the different sections, the Driefontein-Angelo indicates approximately 50 per cent of payability, the Hercules only 20 per cent, which is too low to warrant further work, and the Cason-Cinderella promises certain quantities of ore over six levels toward the east. The ore reserves are estimated at 2,410,850 tons averaging 6.1 dwt. per ton, of which nearly 10 per cent in the form of shaft and boundary pillars assays 7.8 dwt.



VELVET MINE, NEAR ROSSLAND, B. C. THE BOUNDARY DISTRICT LIES BEYOND HILLS IN DISTANCE

CANADA

British Columbia

Silversmith Mine Suspends Operations Until Market and Costs Improve

Grand Forks—The dining room and cook house of the Rocky Candy mine, the Consolidated M. & S. Co.'s fluorspar property on the North Fork of the Kettle River, were destroyed by fire recently.

Trail—The Consolidated smelter received 7,713 tons of ore for the week ended April 7, all coming from company mines.

Nelson—The Mountain Chief Mining Co., with claims at Renata, on the lower Arrow Lakes, has reorganized and increased its capitalization from 500 shares, par value $100, to 60,000 shares, par value $10. The company produced and shipped a considerable tonnage of copper-bearing ore in 1919.

The Velvet Mine

Property Opened in 1897 Taken Over by Rossland Velvet Mines, Ltd.

BY C. M. CAMPBELL

The Velvet mine, about six miles west of Rossland, B. C., on the old Dewdney trail, has some claim to be considered in Canadian history, aside from its record as a mine. This is due to its connection with Sir Charles Tupper, one of the fathers of the Canadian Confederation and later Premier of Canada. In 1896 Sir Charles was defeated and Wilfrid Laurier became Premier, with the result that the former head of the government retired from active participation in politics. In 1897 he organized the English company that started the development of the Velvet and adjoining claims. For several years this mine produced in some quantity ore running from 5 to 20 per cent copper and from $10 to $20 in gold and silver. Owing to exhaustion of the best lenses and excessive pumping on the lower levels it was shut down about 1902. At that time S. S. Sorensen, now of South America and New York, was superintendent, and F. W. Maclennan, now general manager of the Miami, was assayer. For some time later it was worked by lessees, who confined their attention to the upper levels, which were drained by a tunnel. In 1918 the Granby Consolidated Mining, Smelting & Power Co. optioned the property in the hope that enough ore could be developed

to justify the construction of a crosscut tunnel at depth, but the work done did not apparently warrant the expense. It has now been taken over by the Rossland Velvet Mines, Ltd., and active operations are again about to be started.

Some chromite deposits were located on the neighboring hills several years ago, but when the war stopped, development ceased. The situation of the Velvet, on the upper slopes of a heavily timbered valley, is picturesque in the extreme.

Sandon — The Silversmith mine, the only property that has run with a full crew since the One Big Union strike began last spring, and which continued development during most of the winter with about 40 men, has suspended operations almost entirely. Only three or four men remain. It is officially stated that this policy will be continued in force until such time as an improvement is shown in metal marketing conditions or lower production costs are manifest.

Ontario

Conditions at Porcupine Best in Years —Nipissing Cuts Dividend—Powder Drops in Price

Porcupine—For the first time in six years conditions are favorable at Porcupine. Cost of commodities is declining and there is an ample supply of power and of efficient labor. At present, while there is an industrial depression throughout the whole country, the Porcupine district is probably the most prosperous and progressive section in Ontario, and as the camp is just now getting into its stride, every confidence may be expressed as to the future. There can be no question but that 1921 will much surpass 1920, and, as evidenced by the report of the Timmins Board of Trade, last year was the best to date. The report states:

1. That freight receipts for the past year were exceeded by only one town of equal size in Ontario, and amounted to $725,000.

2. Bank clearings for the year amounted to $7,000,000 and largely exceeded those of the best town in Ontario having a population of 10,000.

Indications point to the resumption of work on some of the older properties, and there also appears to be a great deal of interest shown by outside capital, and a number of deals are reported pending.

The North Crown Mines has issued bonds to the extent of $100,000. It is expected that the mill, which had to close down last year on account of the power shortage, will reopen next month. Development work has been carried on in the interval, and some new ore found.

Cobalt—At the recent meeting of the directors of the Nipissing it was decided to reduce the quarterly dividend, which is payable May 20, to 3 per cent. For some time past the company has been paying 5 per cent regularly, and a 5 per cent bonus quarterly. The main shaft house east of the lake was destroyed by fire, and shipment of mill ore by the aerial tramway has been stopped. Production is being maintained, however, from shafts west of the lake. During March the company mined ore of an estimated net value of $156,775 and shipped bullion from Nipissing and customs ore of an estimated net value of $336,584.

The Hudson Bay, which has been operating with a few men, has closed.

The Cobalt Aladdin has started shipments of milling ore to the Bailey customs mill.

The Kerr Lake is getting about $60,000 oz. a month from its Vipont property in Utah.

The Frontier silver mine in South Lorrain is making arrangements to ship ore as soon as navigation opens.

Another drop in the price of powder for Northern Ontario, of approximately $1.50 a hundred pounds, has been announced. The new prices effective are $19.50 for 40 per cent forcite, $21.50 for 50 per cent and $23.50 for 60 per cent.

MEXICO

Zacatecas

Dos Estrellas Company Sampling Veta Grande Properties; Acquisition Said To Be Less Desirable Since Silver Dropped

Zacatecas, March 30 — The Dos Estrellas Mining Co., of El Oro, State of Mexico, has been actively engaged since Jan. 1, 1921, in opening up and sampling the famous Veta Grande properties, situated at about eight kilometers east of Zacatecas City. At this time George F. Schattinger, the engineer in charge, has about 350 men at work. Much interest is being manifested as to whether they will exercise their option upon these properties, as in the event of their so doing a new era of prosperity is in store for Zacatecas. It is known that there is well over half a million tons of siliceous silver ore in the dumps and there is reputed to exist upwards of twice this amount of siliceous fills in the mines, which have an unbroken length of over four kilometers, but as both fills and dumps are supposed to carry but about 8 oz. silver and about 50c. gold, it will be interesting to see whether the general manager of the company, Mr. T. Skewes Saunders, who is here on an inspection trip, will decide to erect a power plant and mill for the purpose of treating these low-grade ores. It is understood that there is a quantity of lead-zinc ore in one of the veins below the present water level, but the management has not attempted to unwater the mine but has confined examination and sampling work to those workings above water level. These properties were the subject of active investigation at the beginning of last year when the price of silver was over a dollar and were then believed to constitute a most desirable acquisition, but with silver at around 55c. per oz. it is much feared that such will not be considered by the Estrellas company as having sufficient merit to warrant the big expenditure that will be entailed in providing suitable mining, milling and power equipments.

The Cia. de Inversiones, a subsidiary of the El Oro Mining & Railway Co., is actively engaged in unwatering and examining the San Bernabé and Los Campos properties in the immediate vicinity of Zacatecas City. The same company is reported to have obtained an examination option upon the well known Noria mine in the Sombrerete district of this state.

Engineers on behalf of New York capitalists are examining the San Rafael mine, located in the heart of Zacatecas City, said property being controlled by John Lee Stark, who is well known in local mining circles.

Coahuila

Seeking Fuel for Torreon Smelter

Torreon—A number of Chinese business men of this city are preparing to develop the Caridad group in the Velardeña district. The property lies adjacent to the Wa Hu mines, which were formerly operated by Chinese and produced some good commerical ore.

An effort is still being made by the Peñoles Mining Co. to obtain a sufficient supply of fuel to blow in a few furnaces at the Torreon smelter to smelt the ores on hand. Owing to the conditions of the railroads caused by the strike which was started the latter part of February it is impossible to get cars to bring in fuel.

Word has just been received here of the suspension of the Aguascalientes smelter likewise owing to lack of fuel.

Saltillo—Ramon R. Trevino, of Monclova, has denounced six *pertenencias* in the Fueste Mountains near the village of Ocampo. The survey will include a portion of the old Messina mine, which was formerly owned by Carlos Mosler, deceased.

Joaquin F. Mendoza is developing some extensive iron deposits carrying lead and silver and located in the Santa Rosa Mountains about four miles south of the Muzquiz mining camp in this state. The property consists of six claims adjoining the Porvenir and the old abandoned mines of San Juan.

ARIZONA

United Verde's Man Hoist Completed—Arkansas & Arizona Copper Co. Sues United Verde

Jerome—The new United Verde man hoist is practically complete, succeeding No. 3 shaft, which will be used in the future only as an air shaft. The new top station is on the 500 level, reached by a 500-ft. tunnel, through which runs an electric railway, with 20-man cars. Each double-deck cage will handle fifty men, who will be taken down in veritable elevator cars, each weighing 10 tons, with safety devices that will prevent lowering before all doors are locked. The several large rooms of the station are walled with concrete. Power is electric and an electric crane is provided for shifting machinery or material. Communication through the shaft is to the 1900 level, though it is to be continued down to the lowest workings, at 2400 ft.

Prescott—Suit has been filed in Prescott by the Arkansas & Arizona Copper Co. against the United Verde Copper Co. to prevent the latter from securing patent to a part of the Diamond lode mining claim, alleged to be the property of the plaintiff, but included by the defendant within its Chrome Fraction mining claim. Plaintiff relates that the Diamond claim was located in 1911 by William Bracken, that it passed to the company in June, 1916, and that all assessment work has been done upon it save in the years when no assessment work was required.

The Jerome-Prescott Copper Co. has leased its thirty-two Copper Basin claims to F. M. Parker, L. O. Williams and W. E. Sanders, on a royalty basis. The deepest development is 126 ft.

Globe—There has been a general exodus of unmarried American miners, most of them going to points in Southern California, though many have headed for gold camps known to them in Nevada, California and Colorado. Hundreds of those who remain will be given work on the roads. A well developed plan of road work has been announced from Superior, where 350 men are to be employed on the rock work of the Miami-Superior highway and on the Ray-Superior and Ray-Mesa roads. Hundreds more of the unemployed are to find work on silver mines that have been idle for a decade or more, including the old Centennial mine and mines in Richmond Basin and in the Ramboz section. Much of the new work is being done under lease agreements.

It is announced that the plans of the Louis d'Or mining company will not be affected by the shutdown of local copper producers.

Old Dominion has added a 1200-hp. Diesel engine to its equipment.

Parker—T. J. Carrigan has started construction of a 300-ton mill on the Arizona Standard Copper Co.'s property, fourteen miles east of Parker and seven miles from a station on the Swansea railroad. Machinery is from the Llewellyn works of Los Angeles. Concrete houses are being erected for employees.

Tombstone — Local lessees recently "cleaned up," more than 40 cars of ore, which were rushed to Douglas before April 12, the final date set for reception at Douglas, where April 15 had been designated for complete closing of the Phelps Dodge smelter. It is possible that activities will be continued at Tombstone, even at the Phelps Dodge mines, for it is understood that a silver stack is to be kept in operation at the El Paso smelter. Several silver concentrators are available in the camp and it is suggested that the ores running 10 oz. or less be milled and that the richer ores be held for the reopening of the Douglas smelter. The relatively slack water supply has been taken into consideration, though an inexhaustible supply could be had by pumping from the old Tombstone Consolidated Boom shaft. Transporation from the shafts to the mills will be afforded by a fleet of large motor trucks. One company is reported to be planning mill additions covering flotation and cyaniding, with enough smelting equipment to turn out bullion.

The Old Guard mill has been rebuilt by the National Metals Recovery Co., which will rework a number of the old waste ore dumps of the district. About 80 tons of ore is being handled daily on three shifts.

NEW MEXICO

Great Eagle Fluorspar Mill Makes Trial Run—Tullock Silver Property Near White Signal Leased—Shipping Iron Ore From Jack's Peak

Lordsburg—A trial run of the new mill of the Great Eagle fluorspar property indicates an 80-ton capacity of 100-mesh product. At present fluorspar from this property is being milled en route, a special freight rate having been made to cover this condition. The marketing of this product has been placed in the hands of W. J. Prowell, of Philadelphia, and the demand for this particular grade of fluorspar for enamel, glass and acid purposes is good. Alfred Roos is manager.

Development work on the 1050 level of the 85 mine is showing copper sulphide ores from 7 to 10 ft. wide, running very high in copper.

The Co-operative Mining Co. continues to produce lead-silver ore of excellent grade from the ore shoot on the 4th level which shows a width of 4 ft. A considerable tonnage of mill rock is being put on the dump and in No. 1 and 2 stopes on the third level, awaiting the completion of additions to the mill which will give a daily capacity of 100 tons. About 35 men are working. H. C. Walters is manager.

White Signal—C. W. Mitchell has taken a lease and option upon the Tullock silver property, three miles south of White Signal, and is in New York in consultation with interested parties. On the gold property near by, also owned by Tullock, William Sellers is unwatering an old shaft. He has installed a string of sluice boxes and is using water from the shaft to wash the dirt from the dump, which is yielding about half an ounce of gold per ton. About fifty tons of sulphide copper ore carrying 1 oz. gold and 12 oz. silver has been mined from the surface near the old shaft.

Tecolote — Beeth Brothers have started iron-ore shipments from the Jack's Peak properties, using the five-mile narrow-gage line installed several year ago by Delhart (Texas) interests which have adjoining properties. At present a gasoline locomotive is used, but is not adequate, as the grade is in places 5 per cent. A steam locomotive has been purchased and will be in operation soon. Side-dump cars of five-ton capacity are used. Shipments for the present are about 150 tons weekly to the Colorado Fuel & Iron Co. at Pueblo.

UTAH

Ontario Silver Shuts Down After Smelter Refuses Ore

Eureka—Ore shipments from the Tintic district for the week ended April 9 amounted to 135 cars as compared with 150 cars the week preceding, the decline being due largely to the order of the Garfield smelter of the A. S. & R. suspending shipments of dry silver ores. The Centennial-Eureka and Bullion Beck mines of the United States Smelting Co. have closed down, owing to the closing of the copper smelter of the A. S. & R. at Garfield. The Grand Central has also closed down. It is probable also that the Eureka Hill will suspend. This property, which is being operated by lessees, is worked through the Centennial-Eureka.

Park City—Shipments for the week ended April 9 amounted to 1,489 tons. Shippers were the Judge companies, 840 tons; Silver King Coalition, 649. The Ontario Silver has ceased shipments, owing to an order from the Garfield smelter refusing to take its ore.

IDAHO

Cœur d'Alene District

Callahan Deepening Main Shaft 200 Ft.

Wallace — The Callahan Zinc-Lead Co. is extending the main shaft 200 ft. deeper, which will make the total depth from the main working tunnel 1,450 ft.

Wallace—At the annual meeting of Hecla Mining Co., held here on April 12, all former directors were re-elected. James F. McCarthy was re-elected president and general manager; W. J. C. Wakefield, vice-president; James F. McCarthy, treasurer, and L. E. Hanley, or Wallace, Idaho, secretary.

Much interest attached to the outcome of the meeting, as it was known that a desire existed among a section of the shareholders to suspend operations pending more favorable conditions. The directors, however, decided that for the present, at least, operations should continue at the present scale, in an effort to hold the organization together and prevent as little distress as possible in the ranks of the mining company's working forces, during the difficult readjustment period.

WASHINGTON

Bead Lake Gold-Copper Elects Officers

Northport—The lead smelter of the Northport Smelting & Refining Co. has closed down temporarily. The shutdown was occasioned by the closing of several Cœur d'Alene lead mines from which the smelter receives the greater portion of its ores.

Newport—The Bead Lake Gold-Copper Co. recently held its annual directors' meeting and elected the following officers: president, G. C. Geisler; vice-president, C. C. Witt; and secretary-treasurer, W. E. Allen; superintendent, C. H. Curtis. During the last year the company completed about 500 ft. of drifting and crosscutting, installed a small sawmill and cut sufficient

lumber for a 100-ton concentrator, administration building, and superintendent's residence. All of these buildings were completed but the mill machinery is not yet installed. The adjoining Conquest mine was purchased and the company now plans to retimber the old Conquest Shaft and then deepen it 200 ft. Before the mill is put in operation it will be necessary to build an 800-ft. aerial tramway to link the Bead Lake openings with the concentrator. The holdings of the company are in Pend Oreille County, 5 miles east of Newport and within a mile of the boundary.

Chewelah—The United Silver-Copper company is employing a small crew to mine on the high-grade shoot of tetrahedrite between the 600 and 800 levels. Nine cars of this sorted ore were shipped during the first three months of the year. These averaged 40 to 50 oz. of silver and 10 per cent copper to the ton and netted about $1,200 to the car. The concentrator closed down several months ago, for the lower-grade milling ore can not now be treated at a profit.

Oroville—The Washington State Public Service Commission has ordered the Great Northern Railway to continue its regular six-day passenger service on the Marcus-Oroville and Curlew-Republic branches until further notice and to file weekly reports with the commission. This order was made pursuant to announcement by the railway company of intention to reduce the present daily service to a tri-weekly service effective April 1.

Danville—Plans are being considered by La Fleur St. James Mining Co., following a directors' meeting held at Oroville in March, for resumption of development on the company's property near here this spring.

MINNESOTA

Stevenson Mine First Shipper From Mesabi

Superior—The construction work on the No. 3 Great Northern ore dock is rapidly nearing completion. The dock is up-to-date. Spouts are operated electrically and the pockets are lined with concrete slabs.

Cuyuna Range

Adbar Development Co. Diamond Drilling Joan No. 4 Property at Trommald

Brainerd—In the case of Mines Timber Co. and others against the Oneida Mines Co., District Judge W. S. McClenahan has recently handed down a decision which holds that the fee owners of mines are "bound under well-recognized principles of equity" to pay for improvements on their properties providing the lessees fail to do so. The Mines Timber Co. and other plaintiffs were lien claimants against the defendant company in the sum of more than $100,000 for materials, labor, and supplies furnished for the opening up of the Clark mine, a manganiferous iron ore property closed down after the armistice before any ore had been produced. The fee owners had cancelled the leases, owing to failure of the lessee to maintain royalty payments. Should Judge McClenahan's decision be sustained in the higher courts, it is expected that it will bring about some material changes in the form of Minnesota mining leases.

Crosby—The Inland Steel Co. reopened its Armour No. 2 mine on April 5 after a five week's shutdown, and made the first shipments for the season from the Cuyuna Range. Shipments from shaft pocket will be made at the rate of about fourteen cars per day during April and loading of the winter's stockpile will also be started. It is stated that the company plans to complete the shipment of four cargoes before May 1 if possible.

Trommald—Diamond drilling has been started on the NE¼ of SW¼ of Sect. 32, 46-29—the old Joan No. 4 mine property—by the Adbar Development Co., which now has this forty under option. The Joan mine, formerly operated by the Marcus Fay interests, was closed down early in 1919 after the shipment of 40,000 tons of high-grade manganiferous ore, and the lease on the property was subsequently surrendered.

Mesabi Range

Hibbing—The Stevenson mine of the McKinney Steel Co. has the distinction of being the first shipper from the Mesabi Range, as its stock pile of 8,000 tons was shipped to the Allouez docks of the Great Northern R.R. whence it was taken by steamer to a lower lake port.

Chisholm—Stripping in the Hartley pit, the Oliver company was delayed by the flooding of a portion of the pit through the breaking of a ditch into the pit. It is expected that work will resume soon. Stripping at the Frazer pit, a new property of the same company, was stopped for a week to permit the track system to be re-aligned and ballasted.

MICHIGAN

Gogebic Range

Oglebay-Norton Co.'s Mines Cease Production — Oliver Iron To Start Shipments From Ashland

Ironwood—All mines of the Oglebay-Norton Co. on the Gogebic Range have received orders to stop production. Operations will be confined to exploratory work, pumping, and necessary timbering. Some single men without dependents have been laid off. As many men as possible will be retained on a half-time basis. Under the new plan 110 men will be employed at the Montreal, 300 at the Ottawa, and 600 at the Eureka, Castile, and Asteroid. Nearly all of the 1920 tonnage shipped from these mines is still unused at the lower lake ports or at the furnaces, and until the furnaces are again in operation there will be practically no demand for further shipments.

On April 12 the Steel & Tube Co. started to ship 1,500 tons of Palms-Anvil ore daily to the company's furnaces at Nayville, Wis.

The Plymouth pit, which has been idle since the early part of January, has resumed stripping operations with one shovel and about 130 men.

Chequamegon Bay, at Ashland, is clear of ice, and it is reported that the Oliver Iron Mining Co., will begin shipping within the next few days.

The Cole-Goudie shovel, which has been tried out at the East Norrie mine for some months past, has been placed on the market and promises to be an important factor in mechanical shoveling.

The booster compressor for the "G" Pabst power plant has arrived and will be installed immediately.

Menominee Range

More Mines Closed at Iron River—Three at Crystal Falls with Full Crews

Iron River—The Bates mine has been closed down for an indefinite period. A few days before the Rogers-Brown Ore Co. had closed its Hiawatha, Rogers and Chicagoan properties. The Homer, Davidson and Dober mines are the only ones in the Iron River field being worked full time. The Baltic, Fogarty, Berkshire and James are being operated part time.

Crystal Falls—The Carpenter, Balkan and Amasa-Porter mines are the only ones in the Crystal Falls district working with full crews. The Odgers, Bristol and Warner are working part time. Shaft sinking only is being carried on at the Bristol and Warner properties. The Judson is employing a few men in development work. There are not more than 1,000 men working in Iron County, which includes the Crystal Falls and Iron River fields, if one figures two men to a day's work on the half time basis.

The Copper Country

Mohawk-Wolverine Wage Cut Represents Cost Reduction of 1 to 1½c.

Calumet—Although the Calumet & Hecla Mining Co. and subsidiaries have ceased all copper production, some men will be kept working at all their properties for watching, pumping and such duties. A 25-per cent reduction in wages and salaries became effective April 16. Retiring directors were re-elected at the annual meeting.

The Seneca Mining Co. has started stoping operations on the north side of the 4th level. The results of this operation will be watched with interest because it is the first stope started on the property, and may give some idea of what to expect from future stoping. Drifts have been started both north and south on the 6th level.

The reduction of wages and salaries which became effective at these properties on April 1 will reduce their cost of producing copper somewhere between 1c. and 1½c. per lb.

OKLAHOMA

Picher—The Eagle-Picher Lead Co. shut down its mines on April 22.

THE MARKET REPORT

Daily Prices of Metals

April	Copper, N. Y., net refinery*	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
14	12.50	28.50	29.75	4.25@4.40	4.20	4.60
15	12.25@12.50	29.00	30.25	4.25@4.30	4.20	4.65
16	12.25@12.50	29.00	30.50	4.25@4.30	4.20	4.65
18	12.25@12.50	29.75	31.00	4.25@4.30	4.20	4.70
19	12.25@12.50	29.50	30.75	4.25@4.30	4.20	4.70@4.75
20	12.25@12.50	29.25	30.75	4.25@4.30	4.20	4.75

*These prices correspond to the following quotations for copper, "delivered": 12.75c. on April 14, and 12.50@12.75c for April 15 to 20 inclusive.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York, cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin.

London

April	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3 M		Spot	3 M	Spot	3 M	Spot	3 M
14	68⅝	68¾	72	159	162¼	20½	21⅛	25¼	26¼
15	69	69¼	71	160¾	164¼	20½	21⅛	25½	26½
16	...	...	...	...	...	...	...	...	...
18	69¾	70	71	169	171½	20⅝	21	25⅞	27
19	69¾	70	71	168	169¾	20⅝	21⅜	26	27
20	70⅛	70½	71	166¾	169¼	21	21⅝	26	26⅞

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver and Sterling Exchange

April	Sterling Exchange	Silver			Apr.	Sterling Exchange	Silver		
		New York, Domestic Origin	New York, Foreign Origin	London			New York, Domestic Origin	New York, Foreign Origin	London
14	390	99½	58¾	34⅛	18	392	99½	61¼	35⅜
15	391	99½	58½	33¾	19	392	99½	60⅜	34⅝
16	391½	99½	59⅞	34½	20	392	99½	60⅝	35

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

Metal Markets

New York, April 20, 1921

Sales continue of small volume, with prices varying little from those quoted last week. General business conditions show improvement in certain lines, but there is still no demand of importance for raw materials of any kind. Among consumers of metal, the automobile manufacturers seem to be returning to normal conditions faster than any others. This activity is reflected in a better demand for copper and zinc by Middle-Western brass makers, and in increased requirements for lead by storage-battery manufacturers.

The tariff situation has had some effect on conditions in the metal trade, but the whole subject is still indefinite.

Copper

Business has languished during the last week, and the demand has generally been for small lots from consumers who require the metal for early use. There has been a pronounced disposition to hunt for bargains and to laugh down any producer who quotes 12.75 or 13c. delivered. Coupled with this is the fact that the meager demand has made some interests anxious to dispose of their stocks without waiting longer. Some business has therefore been done as low as 12.50c., delivered, for prompt shipment. Large quantities are not obtainable at this price, however, and there is every likelihood that the leading intersts will soon be able to obtain their asking price of 12.75 @13c.; in fact, business was done at the lower figure all during the week. The premium on July delivery would be about 25 points over the prices which we quote.

Export demand has been disappointingly small, and has of course been affected by the disturbed conditions in England. Some small inquiries have been on the market from Japan, but the business is not of sufficient importance to warrant the newspaper comment that has been made upon it. Most of it was done with the understanding that the metal could be resold in this country if desired, although the small amount which was sold through the Export Association must actually be exported.

Lead

The official price of the A. S. & R. continues to be 4.25c., New York and St. Louis. This producer has done practically all of the business in New York, as most other interests are asking premiums up to 4.50c. In St. Louis, however, the A. S. & R. price has been shaded somewhat, and lead is freely offered there at 4.20c. by other producers. The slight weakening in the market was unexpected, and is unlikely to persist, because production is being further curtailed, and consumption, already good compared with other metals, shows signs of increasing. The price in London is also becoming stronger, and at present lead could not be imported direct from England for less than 4.50c., New York. Chemical lead is offered at 4.25@4.40c., St. Louis. Almost no future lead is obtainable except at prohibitive premiums.

Zinc

The market has taken a decided turn upward, advancing a total of 10 points during the week. Sales have not been much larger than usual, but the number of inquiries has increased, particularly from galvanizers, and better demand from this important class of zinc consumers has created a firmer undertone to the market. Whether due primarily to the drop in steel prices it is difficult to say, as steel prices are still high. Some producers feel that zinc has turned the corner and is due for a continued rise, whereas other market followers point to the heavy stocks in the country as a deterrent to any advance. High-grade is still quoted at 6.75c.

Tin

Demand continues dull, but there is no metal pressing for sale, and prices have been firm, in view of the London advance. Some 99 per cent could be obtained for less than our quotations, but the grade is undesirable, although

a good delivery on the New York Metal Exchange. The available supplies of tin are not as large as formerly and seem to be closely held. We quote the price of futures the same as for spot Straits.

Arrivals of tin, in long tons: April 12th, China, 15; 14th, Penang, 100; 15th, London, 50.

Silver

The silver market in London declined the early part of the week on China selling, but advanced later on buying for both Indian bazaars and China account. The market is erratic, owing to speculative operations in China exchanges, causing sharp advances when orders are placed to buy at the market in London, with small supplies of silver offering. On the other hand, the market reacts quickly when these speculative orders are withdrawn, as the economic conditions in China do not warrant the high prices paid for China account. There is probably still a large bear account in China exchanges, which accounts for the speculative purchases. Indian bazaars continue to absorb silver, so that the general outlook indicates a continuance of prices around present levels. Supplies of silver from the mines continue only moderate, although there are some indications of a revival of mining activity in Mexico. Domestic demand continues dull.

Mexican Dollars—April 14th, 44⅞; 15th, 44½; 16th, 45⅝; 18th, 46⅞; 19th, 46⅛; 20th, 46⅛.

Gold

Gold in London: April 14th, 105s. 4d.; 15th, 104s. 11d.; 18th, 104s. 8d.; 19th, 104s. 8d.; 20th, 104s. 8d.

General stock of money in the United States, April 1: Gold coin (including bullion in treasury), $3,001,487,915; standard silver dollars, $272,112,326; subsidiary silver, $271,111,530; United States notes, $346,681,016; Federal Reserve notes, $3,265,571,195; Federal Reserve Bank notes, $192,991,400; National Bank notes, $732,818,484; total, $8,082,773,866.

Foreign Exchange

On Tuesday, April 19, francs were 7.2275c.; lire, 4.785c.; and marks, 1.57c. New York funds in Montreal, 12.68 per cent premium.

Other Metals

Quotations cover large wholesale lots unless otherwise specified

Aluminum—List prices of 28@28.5c. are nominal. Outside market, 22@23c. per lb.; 22½c. for imports, duty paid.

Antimony — Chinese and Japanese brands, 5⅛c.; market dull. W.C.C. brand, 5¾@6c. per lb. Cookson's "C" grade, spot, 9⅝c. Chinese needle antimony, lump, nominal at 4½c. per lb. Standard powdered needle antimony (200 mesh), nominal at 6@6½c. per lb.

White antimony oxide, Chinese, guaranteed 99 per cent Sb_2O_3, wholesale lots, 6½@7c.

Bismuth—$1.50@$1.60 per lb., 500-lb. lots.

Cadmium—Nominal, $1@$1.10 per lb., in 1,000-lb. lots. Smaller quantities, $1.10@$1.25 per lb.

Cobalt—Metal, $4 per lb.; black oxide, $3@$3.10 per lb. in bbls.; sulphate, $1.35 per lb. in bbls.

Iridium—Nominal, $250@$300 per oz.

[1]**Molybdenum Metal** in rod or wire form, 99.9 per cent pure, $32@$40 per lb., according to gage.

Nickel—Standard market, ingot, 41c.; shot, 41c.; electrolytic, 44c. Small tonnages, spot, 38@40c.

Monel Metal—Shot, 35c.; blocks, 35c., and ingots, 38c. per lb., f.o.b. Bayonne.

Osmium—$70@$80 per troy oz.

Palladium—$65@$70 per oz.

Platinum—$72@$75 per oz.

Quicksilver—Nominally, $44@$46 per 75-lb. flask. San Francisco wires, $46.

[1]**Rhodium**—$200@$225 per troy oz.

Ruthenium—$175@$200 per troy oz.

[1]**Selenium**—Black powdered, amorphous, 99.5 per cent pure, $2@$2.25 per lb.

[1]**Thallium Metal**—Ingot, 99 per cent pure, $20 per lb.

[1]**Tungsten Metal**—Wire, $35@$60 per kilogram, according to purity and gage.

Metallic Ores

Chrome Ore—Guaranteed 50 per cent Cr_2O_3 foreign ore with a maximum of 6 per cent silica, 45@50c. per long ton unit, f.o.b. Atlantic ports.

Iron Ore—Lake Superior ores, per ton, Lower Lake ports: Old Range bessemer, 55 per cent iron, $7.45; Mesabi bessemer, 55 per cent iron, $7.20; Old Range non-bessemer, 51½ per cent iron, $6.70; Mesabi non-bessemer, 51½ per cent iron, $6.55.

Magnetite Ore—F.o.b. Port Henry, N. Y.: Old bed 21 furnace, $5.80; old bed concentrates, 63 per cent, $6.70; Harmony, cobbed, 63 per cent, $6.70; new bed low phosphorus, 65 per cent, $9.50.

Manganese Ore—30c. per unit, seaport; chemical ore (MnO_2) $60 per gross ton, lump; $70@$75 per net ton, powdered.

Molybdenum Ore—85 per cent MoS_2, 55@60c. per lb. of contained sulphide, New York.

Tantalum Ore—Guaranteed minimum 60 per cent tantalic acid, 50c. per lb. in ton lots.

[1]**Titanium Ores**—Ilmenite, 52 per cent TiO_2, 1½@2c. per lb. for ore. Rutile, 95 per cent TiO_2, 12c. per lb. for ore, with concessions on large lots or contracts.

Tungsten Ore—Scheelite or wolframite, 60 per cent WO_3 and over, per unit of WO_3, $3@$3.25, f.o.b. Atlantic ports.

Uranium Ore (Carnotite)—Ore containing 1½ per cent U_3O_8 and 5 per cent V_2O_5 sells for $1.50 per lb. of U_3O_8 and 75c. per lb. of V_2O_5; ore containing 2 per cent U_3O_8 and 5 per cent V_2O_5 sells for $2.25 and 75c. per lb., respectively; higher U_3O_8 and V_2O_5 content commands proportionately higher prices.

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

Vanadium Ore—$1.50 per lb. of V_2O_5 (guaranteed minimum of 18 per cent V_2O_5), New York.

[1]**Zircon**—Washed, iron free, 3c. per lb.

[1]**Zirkite**—According to conditions, $70@$90 per ton, carload lots. Pure white oxide, 99 per cent, is quoted at $1.15 per lb. in ton lots.

Zinc and Lead Ore Markets

Joplin, Mo., April 16 — Zinc blende, per ton, high, $24.85; basis 60 per cent zinc, premium and Prime Western, $22.50; fines and slimes, $21@$20; calamine, 40 per cent zinc, $12. Average settling prices: Blende, $22.76; calamine, $10; all zinc ores, $22.68.

Lead, high, $46.30; basis 80 per cent lead, $47.50; average settling prices, all grades of lead, $44 per ton.

Shipments for the week: Blende, 5,153; calamine, 30; lead, 959 tons. Value, all ores the week, $159,790.

Buyers took 1,200 tons less zinc blende in this week's purchase than in each of the last two weeks. Sellers believe the lower offerings were made in an effort to break down the solid front of sellers in refusing to sell for less than $22.50 basis.

Platteville, Wis., April 16—No market for zinc or lead ores. Shipments for the week: Blende, 382 tons. Shipments for the year: Blende, 11,211; lead ore, 550 tons. Shipped during the week to separating plants, 447 tons blende.

Non-Metallic Minerals

Asbestos — Crude, No. 1, $2,000@$3,000; No. 2, $1,400@$2,000; spinning fibres, $400@$1,000; magnesia and compressed sheet fibres, $325@$500; shingle stock, $110@$150; paper stock, $60@$75; cement stock, $17.50@$30; floats, $8.50@$15, all per short ton, f.o.b. Thetford, Broughton, and Black Lake mines, Quebec, Canada; 5 per cent to be added as export sales tax.

Barytes—Crude, 88 to 94 per cent barium content, $10@$12 per net ton; ground (white) $24@$30 in bags, carload lots; (off-color) $22@$26 in bags, carload lots; all f.o.b. South Carolina points. Foreign barytes, prime white material, $25 per net ton f.o.b. Atlantic seaports. Western grades are $24.50. Crude quoted $7 per long ton, f.o.b. Cartersville, Ga. Small lots as low as $5.

Bauxite—High-grade French bauxite, $8@$10 per ton, Atlantic ports. American quotations the same. Consumers generally well supplied. Prices vary according to grade. Crude, unground, $16.50 per ton; ground, $22; calcined, ground $35; unground, $45, f.o.b. plant.

Chalk—English, extra light, 5@5½c. Domestic light, 4½@5c.; heavy, 4@4½c. per lb., all f.o.b. New York.

China Clay (Kaolin)—Crude, $8@$10; washed, $10@$12; powdered, $15@$20; bags extra, per net ton, f.o.b. mines, Georgia; powdered clay, $15@$20, f.o.b. Virginia points. Domestic lump, $10@$20; powdered, $25@$30; imported lump, $15@$25, f.o.b. American ports; powdered, $35@$45, f.o.b. New York.

Feldspar—Crude, $8@$14 per gross ton, f.o.b. Maryland and North Carolina points; $7.50@$10, f.o.b. Maine; ground, $27@$30, car lots, f.o.b. Baltimore; ground, $17@$21, f.o.b. North Carolina points; $17@$21 per ton, No. 1 ground, f.o.b. New York State; $21@$23 per ton, ground, f.o.b. Maine.

Fluorspar — Gravel, guaranteed 85 per cent calcium fluoride and not over 6 per cent silica, $20@$25 per ton, f.o.b. Illinois mines, and $20@$25, f.o.b. Kentucky; ground, suitable for acid, chemical or enameling purposes, $40@$60; lump, $17.50, f.o.b. Heathden, N. M. Ground acid grade, 97 per cent CaF_2, $32, New Mexico. Canadian price generally $18 (Canadian currency) per ton, f.o.b. mines.

Fuller's Earth—16 to 30 mesh, $21; 30 to 60 mesh, $23; 60 to 100 mesh, $19; 100 plus mesh, $15, f.o.b. plants, Pa. California grades, $15@$25, f.o.b. mines. Imported, English, $24@$27, f.o.b. Atlantic ports.

Graphite—Ceylon lump, first quality, 7½@8c. per lb.; chip, 6@6½c.; dust, 4@4½c. No. 1 flake, 7c.; amorphous crude, ¾c.@2¼c.

Gypsum—Plaster of paris in carload lots sells for $4.25 per 250-lb. bbl., alongside dock, New York. Raw crushed rock, $3.50@$4.50; calcined stucco, $9; f.o.b. works, Illinois.

Kaolin—See China Clay.

Limestone—Crushed, New York State shipping points, ¾ in. size, $1.40@$2 per net ton; 1½ in., $1.50@$2. Prices for other sizes practically the same. Agricultural limestone, $2.50@$4.50 per net ton, f.o.b. eastern shipping points, depending upon analysis.

Magnesite, Calcined—Crude, $12@$15 per ton. High-grade caustic calcined, lump form, $30@$40 per ton. Plastic calcined, $56 in barrels, carload lots, f.o.b. California points. Atlantic seaboard, $60.

Dead-Burned — $38 per net ton, Chewelah, Wash.; $58@$64, Chester, Pa. Austrian grade, $55@$60 per ton, f.o.b. Baltimore. (Magnesite brick—See Refractories.) High freight rates retarding business. Steamers quoting $8, Pacific to Atlantic ports.

Mica—India block mica, slightly stained, per lb.: No. 6, 35c.; No. 5, $1.20; No. 4, $2.50@$3; No. 3, $3.50@$4; No. 2, $4.50@$6; No. 1, $5.50@$6.50. Clear block: No. 6, 50c.; No. 5, $1.75; No. 4, $3.25; No. 3, $5; No. 2, $6.50; No. 1, $8; A1, $6.50@$8.50; extra large, $25; ground, wallpaper grade, $90@$160 per ton (depending upon quantity); all f.o.b. New York.

[1]**Monazite** — Minimum of 6 per cent thorium oxide, quoted $30 per unit, duty paid.

Phosphate Rock—Per long ton, Florida ports: 77 per cent tricalcium phosphate, $12.50; 75 per cent, $11.50; 75@74 per cent, $11; 70 per cent, $7.35; 68 per cent, $6.85; 68@66 per cent, $6.60.

[1]Foote Mineral Co., Philadelphia, Pa.

Pumice Stone—Imported, lump, 4@50c. per lb.; domestic lump, 6c.; ground, 4@7c., all f.o.b. New York.

Pyrites—Spanish fines, per unit, 14c., c.i.f. Atlantic seaport; furnace size, 14c.; Spanish lump, 12@14c.; domestic fines, f.o.b. mines, Georgia, 12 @ 14c.

Quartz—(Acid tower) fist to head, $10; 1½ to 2 in., $14; rice, $17; all net ton, f.o.b. Baltimore; lump, carload lots, $5@$7.50 net ton, f.o.b. North Carolina mines.

Silica — Glass sand, $2.25 per ton; sand-blast material, $2.25, both f.o.b. Indiana points. Amorphous or decomposed variety, soft silica, 250 to 500 mesh, $16@$30 per ton. Ganister, crude, $2.50 per ton, f.o.b. Illinois points. Market reported generally dull.

Sulphur—$18 per ton for domestic; $18@$20 for export, f.o.b. Texas and Louisiana mines. Market quiet.

Talc—Paper making, $11@$20 per ton; roofing grades, $8.50@$13; rubber grades, $11@$18; all f.o.b. Vermont. California talc, $18@$40, talcum powder grade. Southern talc, powdered, carload lots, $10@$14 per ton; less than carload, $25, f.o.b. cars. Imported, $35@$40; Canadian, $20@$40 per ton.

Mineral Products

Arsenic — White arsenic, 8@9c. per lb. in carload lots.

Sodium Nitrate — $2.60 @ $2.75 per cwt. ex vessel, Atlantic ports.

Sodium Sulphate—For 95 per cent material, $20 per ton, f.o.b. mines, Idaho and Arizona, spot and six months' contract; $32@$33 per ton, New York.

Potassium Sulphate—Domestic, $215@$220 per net ton, basis 90 per cent, f.o.b. New York.

Ferro Alloys

Ferrotitanium—For 15 to 18 per cent material, $200@$225 per ton, f.o.b. Niagara Falls, N. Y.

Ferrocerium—Per lb., $12@$15.

Ferrochrome—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 15c. per lb. of chromium contained; 4 to 6 per cent carbon, 16@17c., f.o.b. works.

Ferromanganese—Domestic 76 to 80 per cent, $85@$90, f.o.b. furnace; resale, $90, delivered; English, $90@$95, c.i.f. Atlantic seaports. Spiegeleisen, 18@20 per cent, $32, f.o.b. furnace.

Ferromolybdenum—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, $2.50 per lb. of contained metal, f.o.b. works.

Ferrosilicon—For 10 to 15 per cent, per gross ton, f.o.b. works, $50@$55; 50 per cent, $80@$85; 75 per cent, $145@$150.

Ferrotungsten—Domestic, 70 to 80 per cent W, 50@55c. per lb. of contained tungsten, f.o.b. works. Foreign, 50c., duty paid, f.o.b. Atlantic ports.

Ferro-uranium—35 to 50 per cent U, $6 per lb. of U contained, f.o.b. works.

Ferrovanadium—$5@$6 per lb. of V contained, according to analyses and quantity.

Metal Products

Copper Sheets—Current New York list price, 20½@20¾c. per lb.; wire, 15c.

Lead Sheets—Full lead sheets, 7¼c.; cut lead sheets, 7¾c. in quantity, mill lots.

Nickel Silver — 33½c. per lb. for 18 per cent nickel.

Yellow Metal — Dimension sheets 18¼c.; sheathing, 17¼c.; rods, ½ to 3 in., 15¼c.

Zinc Sheets—$11 per 100 lb., less 8 per cent on carload lots, f.o.b. smelter; zinc plates, 10c. per lb.

Refractories

Bauxite Brick—56 per cent alumina, $160 per 1,000, f.o.b. Pittsburgh.

Chrome Cement—40@45 per cent Cr_2O_3, $45@$50 per net ton, and $55 in sacks, carload lots, f.o.b. eastern shipping points.

Chrome Brick—Straights, $80 per net ton, shipping point; arches, keys, wedges, $85; splits, soaps, $100.

Fire Brick—First quality, 9-in. shapes, $55@$60 per 1,000, Pennsylvania, Ohio and Kentucky. Second quality, $45@$50.

Magnesite Brick—9-in. straights, $90@$100 per net ton; 9-in. arches, wedges and keys, $105; soaps and splits, $120.

Silica Brick—9-in., per 1,000: $45@$55 in carload lots, f.o.b. shipping points.

The Iron Trade

Pittsburgh, April 19, 1921

By various changes in the last week or ten days, steel prices have now been equalized, as between the Steel Corporation and the independents.

Prices now developed are: Billets, $37; slabs, $38; sheet bars, $39; rods, $48; bars, 2.10c.; plates and shapes, 2.20c.; blue annealed sheets, 3.10c.; black sheets, 4c.; galvanized sheets, 5c.; tin plate, $6.25; hoops and hot rolled strip, 2.75c.; wire, 3c.; nails, $3.25; steel pipe, 1 to 3-in., 62½ per cent basing discount; steel boiler tubes, 3¼ to 13-in., 43 per cent discount, in less than carloads. On nails the price is that of the Industrial Board schedule, other prices averaging about $6 a ton below that schedule.

Independents closed some extra business as they withdrew their lowest prices, and the Steel Corporation is likely to receive heavier specifications against its contracts. The independents are operating at about 35 per cent.

Pig Iron—The market remains altogether inactive, prices remaining quotable at $25 for bessemer, foundry, and malleable, and $23 for basic, f.o.b. Valley furnaces, with $1.96 freight to Pittsburgh.

Coke

Connellsville—Furnace, $4@$5; foundry, $5@$6.

The New Position of the German Potash Industry

Alsatian Competition Has Destroyed the Empire's Former Monopoly—Sales Increased in 1920, but Production Is Below Pre-War Rate — Possibility of Combination Of Foreign Producers for the Purpose of Price Stabilization

SPECIAL FOREIGN CORRESPONDENCE OF *Engineering and Mining Journal*

NOWHERE do potash salt deposits occur in such abundance as in Germany, where the potash industry, a natural monopoly until the end of the war, is an export business par excellence. Since the beginning of the industry in 1851, annual sales steadily increased and reached a total value of 1,280,000,000 marks in 1919, a marked increase over the preceding year in spite of a decrease in shipments of almost 200,000 metric tons. The important rôle the industry plays in German export trade can hardly be better illustrated than by the fact that out of the total 1919 sales, inland sales amounted to only 250,000,000 marks (200,000,000 in 1918). Shipments to the various countries during 1919 and total shipments during the period 1913-1920 are shown in the following table:

SALES OF GERMAN POTASH
(In Metric Tons)

1919

To—	
Germany (domestic)	637,033
United States	70,129
Scandinavian countries and Denmark	56,011
Holland	30,700
Great Britain	10,279

	Total Sales	Foreign Sales
1913	1,110,370	506,087
1914	903,988	366,180
1915	679,750	112,653
1916	883,976	158,932
1917	1,004,282	132,932
1918	1,001,364	141,648
1919	812,002	174,970
1920	924,168	.....

The year 1920 opened favorably, and brisk business continued up to May, when the effects of the international stagnation began to react upon the industry. Lack of sales—especially export sales—continued throughout the summer, and the situation grew even more unpropitious toward the end of the year, compelling many works to use short shifts and discharge men. Keen disappointment was caused by the failure of the most important market, the United States, to improve, which was all the more surprising as the United States had to do without German potash during the war and the tonnage of substitute potash produced by the American industry is comparatively insignificant, especially when compared with the import of 248,300 tons in 1913. The failure of the American market has given rise to severe criticism on the part of interested German parties and the press, on the price policy of the Potash Syndicate, which is held responsible for the slump in sales to the United States, on account of the exorbitant prices charged. The syndicate, however, strongly resents the charge, contending that no undue profits were made, and that export prices were fixed in accordance with the purchasing power of the different foreign currencies.

In explaining the decrease in sales the syndicate points to the business depression existing during the last year in America. Negotiations for a resumption of potash shipments to the United States are in progress, and it is generally held that present difficulties are but temporary and will soon be overcome.

Some potash mines had to close down of late, but a revival of export business in the autumn is anticipated. The syndicate recently applied to the Federal Potash Syndicate for an advance of inland prices by 50 per cent, but despite its contention that present inland prices represented an increase over pre-war prices of 500 to 600 per cent only, and that inland prices merely covered 60 per cent of cost prices, the application was refused by the vote of the farmers' and workmen's delegates.

Alsatian Competition Important

With the return of Alsace-Lorraine to France, the question of competition from the Alsatian potash industry has had to be faced. The new French industry cannot yet compare in size with the German, as it comprises but eighteen plants and three potassium chloride works, compared with 209 plants and 88 works in Germany; nevertheless great efforts are being made by France to develop the Alsatian potash deposits, and there is no gainsaying the fact that the German pre-war potash monopoly is gone. Alsatian potash production for 1920 amounted to 1,061,197 tons of crude salts, of which 450,000 tons was shipped to France, 327,000 to the United States, 117,000 tons to Belgium, and 92,000 tons to Great-Britain.

German producers, according to a statement by Director Duehrssens of the Potash Syndicate, are however, taking a rather sanguine view of the future of the industry, stressing the fact that high-percentage potash salts, particularly in demand by American farmers, are of rare occurrence in Alsace. It is also pointed out that present production may easily be doubled without sinking new shafts, and that plant extensions on a moderate scale, coupled with an increase in the number of men, would more than treble present output.

The price question, however is causing some apprehension. It is admitted, that Alsatian producers are in a position to underbid German quotations by 15 to 20 per cent, but appropriate measures will be taken in due time with a view of bringing prices in line with Alsatian offers should competition from those quarters assume formidable proportions.

Spanish competition is not considered likely to be pressing for some years to come, owing to the difficulties experienced in sinking Spanish shafts. It is worth pointing out that the German syndicate has shown a marked interest of late in Spanish potash fields, and there are indications that preparations are already well under way for a future cooperation to eliminate competition.

Socialization of the Industry Improbable

The socialization question stands in the background at present and is likely to remain there for some time—if not forever. Investigations made by the Government Socialization Committee are stated to have yielded negative results, the impracticability of applying the principles of socialization to an industry catering first and foremost to the export trade being apparently realized. A notable feature in the development of the industry during the last year has been the marked tendency for concentration and amalgamation of plants. The total capital invested in the industry is estimated at 1,500,000 gold marks. Most of the companies have done well, the average dividend for 1920 working out at 25 per cent.

Regarding the London reparation decisions, it is argued that the Allies are dependent upon German potash and that foreign farmers will have to pay the export tax in form of higher prices. Probably, part of the business will then be lost to Alsatian competition but it is generally held that, for reasons pointed out, elimination of the German potash industry from the world market will prove an impossible task.

COMPANY REPORTS

Phelps Dodge Shows Operating Profit

The report of operations of the Phelps Dodge Corporation for 1920 states that 95,652,508 lb. of copper, 445,215 lb. of lead, 1,372,765 oz. of silver, and 14,357 oz. of gold were produced. In addition, the yield from purchased ores amounted to 3,282,719 lb. copper, 242,417 oz. of silver, and 1,522 oz. of gold. A price of 18.337c. per lb. f.o.b. New York was received from 227,584,468 lb. of copper sold (includes copper received from other sources). Income account:

Income:		
Sales of copper, silver, and gold..	$22,357,915.84	
Sales of coal, coke, and mdse.....	12,974,092.27	
Income from investments and miscellaneous earnings.....	598,169.61	$33,930,177.72
Expenses:		
Finished metals on hand at beginning	$16,877,473.28	
Mining, treating, and refining metals	16,966,467.56	
	$33,843,940.84	
Less finished metals on hand at end	16,412,363.95	
	$17,431,576.89	
Cost of coal, coke and mdse. sold	11,704,704.20	
General and administrative expense	1,128,444.68	
Depreciation of plants.....	1,266,095.90	
Depletion of mines.....	3,666,244.54	35,197,066.21
Net income.....		$733,111.51

Surplus balance Dec. 31, 1919, was $123,794,061.40. Deducting net income for the year, $733,111.51, and dividends of $4,500.000 (10 per cent) gave a surplus on Dec. 31, 1920, of $120,027,172.91.

Inspiration Copper Stocks Increased

The report of operations of the Inspiration Consolidated Copper Co. for 1920 shows that 79,453,740 lb. of copper was produced, at a cost of 14.173c. per lb. (exclusive of depletion and Federal taxes). Income account follows:

Sales of copper.....		$10,033,706.61
Expenses:		
Mining, including development.....	$3,701,140.26	
Reduction, including transportation of ore..	4,385,209.68	
Refining and selling, including transportation of metals.....	2,151,996.21	
Administration and Federal taxes.....	809,188.91	
Copper on hand at beginning of year.....	6,118,331.96	
	$17,165,667.02	
Less, copper on hand at end of year.....	9,746,476.63	7,419,190.39
		$2,614,516.22
Depreciation of buildings and equipment		648,718.80
		$1,965,797.42
Interest received.....	$1,769.81	
Income from investments.....	326,708.85	328,478.66
Balance, net income for year.....		$2,294,276.08

Surplus account Dec. 31, 1919, amounted to $9,879,259.16; net income was $2,294,276.08. Three dividends were paid, totaling $4,136,884.50. Surplus Dec. 31, 1920, $8,036,650.74.

East Butte Has Small Deficit

The annual report of the East Butte Copper Mining Co. for 1920 shows that 18,534,279 lb. of copper, 690,488 oz. of silver, and 867 oz. of gold were produced. Approximately 10,000,000 lb. was in process of manufacture on Dec. 31, 1920, inventoried at 13.90c. Income account follows:

Gross value of metals shipped.....		$3,241,812.96
Other income.....		70,746.51
Gross income from operations.....		$3,312,559.47
Cost of mining, treatment, freight, selling, refining, and cost of custom ore purchased....	$3,047,704.69	
Miscellaneous operations.....	4,621.52	3,052,326.21
Profit on copper mining operations.....		$260,233.26
Less depreciation.....	$44,397.90	
Ore depletion.....	7,199.10	51,597.00
		$208,636.26
Less outside exploration.....		276,798.16
Net deficit on all operations.....		$68,161.90

Mohawk Mining Co. Surplus Decreased

A report of operations of the Mohawk Mining Co. for 1920 indicates that 10,269,824 lb. of copper was produced, at a total cost of 17.545c. per lb.; 8,528,024 lb. was sold at 19.08c. per lb., or $1,627,150.14. The net cost of this copper was $1,046,339.82, giving a profit of $580,810.32. Miscellaneous income amounted to $51,951.40, and total net profit, before providing for depreciation, depletion, and taxes, was $632,761.72

Surplus balance on Jan. 1, 1920, was $2,611,940.24; adding profits and appreciation ($279,286.33) gave $3,523,988.29. Depreciation, depletion, dividends ($550,000), reserve for contingencies ($600,000), and miscellaneous charges reduced surplus to $1,859,936.37.

U. S. Smelting Has Profit of $2,909,274

The report of operations of the U. S. Smelting, Refining & Mining Co. for 1920 shows that 77,545,368 lb. of lead, 18,227,889 oz. of silver, 16,852,918 lb. of zinc, 1,391,116 lb. of copper, 123,175 oz. of gold, 1,548,222 tons of coal, and 3,443,778 lb. of byproducts were produced in that year. Profit and loss account follows:

Earnings of all companies, after charging cost of production, selling expenses, repairs and interest, but before providing for depreciation, depletion, and Federal taxes.....		$6,777,000.07
Deduct:		
Reserves for depreciation and depletion	$1,865,223.35	
Reserves to reduce inventories of metals to market prices at Dec. 31, 1920 (including losses on metals sold in December).....	2,002,501.90	3,867,725.25
Profits for year.....		$2,909,274.82
Undistributed surplus, as per previous balance sheet		$17,330,116.62
Profits for the year, as above.....		2,909,274.82
Amounting to.....		$20,239,391.44
Applied as follows:		
Dividends on preferred stock of U. S. S., R. & M. Co. at 7 per cent per annum.....		1,702.225.00
Dividends on common stock of U. S. S., R. & M. Co. at $5 per share.....		1,755,575.00
Undistributed surplus		16,781,591.44
		$20,239,391.44

The reserve for Federal taxes provided in the previous year is considered sufficient to cover all Federal taxes accrued up to end of 1920.

Calumet & Arizona Sold Entire Output

A report of operations of the Calumet & Arizona Mining Co. for 1920 states that 45,087,408 lb. of copper, 1,214,049 oz. of silver, and 37,911 oz. of gold were produced. Copper sales for the year totaled 47,770,619 lb., for which an average price of 18.5c. per lb. was received. A statement of income and expenditures follows:

EXPENDITURES

Operating expenses, depreciation.....	$6,143,520.36
Salaries, office, general expenses.....	50,382.91
Freight, refining, marketing.....	1,171,977.32
State and Federal taxes.....	840,522.93
	$8,206,403.02
Less:	
Ore depletion.....	1,362,9o9.34
Net income.....	$1,849,201.53
	$11,418,573.89

INCOME

Total earnings on metals.....	$10,527,113.26
Interest.....	131,380.46
Dividends.....	646,745.50
Other income.....	113,334.67
Total.....	$11,418,573.89

Four quarterly dividends were paid, totaling $2,570,084. Surplus account on Dec. 31, 1919, stood at $5,817,069.85; on Dec. 31, 1920, at $5,096,187.38.

MINING STOCKS

Week Ended April 16, 1921

Stock	Exch.	High	Low	Last		Last Div.
COPPER						
Adventure	Boston	*60	*50	*60		
Ahmeek	Boston	50	44	49	Sept. '20, Q	$0.50
Alaska-Br. Col.	N. Y. Curb	⅛	⅛	⅛		
Allouez	Boston	21	18	21	Mar. '19	1.00
Anaconda	New York	38⅛	37	38⅛	Nov. '20, Q	1.00
Arcadian Consol	Boston	2⅛	2	2⅛		
Ariz. Com'l	Boston	8¼	8	8¼	Oct. '18,	.50
Big Ledge	N. Y. Curb	1/16	¼	1/16		
Bingham Mines	Boston	8¼	8	8¼	Sept. '19, Q	.25
Calumet & Arizona	Boston	49	45	48½	Mar. '21, Q	.50
Calumet & Hecla	Boston	230	220	230	June '20, Q	5.00
Canada Copper	N. Y. Curb	....	....	*13		
Centennial	Boston	....	....	8	Dec. '18, SA	1.00
Cerro de Pasco	New York	28	25½	28	Mar. '21, Q	.50
Chile Copper	New York	11⅝	10⅜	11½		
Chino	New York	22¼	21⅛	22¼	Sept. '20, Q	.37½
Columbus Rexall	Salt Lake	*24½	*22½	*24½		
Con. Arizona	N. Y. Curb	....	....	1/16	Dec. '18, Q	.05
Con. Copper M.	N. Y. Curb	....	....	1⅛		
Copper Range	Boston	35	32⅛	34⅛	Sept. '20, Q	.50
Crystal Copper (new)	Boston Curb	*30	*28	*29		
Davis-Daly	Boston	6½	5	6⅜	Mar. '20, Q	.25
East Butte	Boston	8⅜	8	8⅛	Dec. '19, A	.50
First National	Boston Curb	*75	*65	*70	Feb. '19, SA	.15
Franklin	Boston	2	1⅞	1⅞		
Gadsden Copper	N. Y. Curb	....	....	*25		
Granby Consol.	New York	20⅜	19	20⅛	May '19, Q	1.25
Greene-Cananea	New York	23⅜	22⅛	23⅜	Nov. '20, Q	.50
Hancock	Boston	....	....	2⅛		
Howe Sound	N. Y. Curb	2⅜	2⅛	2⅛	Jan. '21, Q	.05
Inspiration Consol.	New York	34	32⅛	33⅜	Oct. '20, Q	1.00
Iron Cap	Boston Curb	....	....	6	Sept. '20, K	.25
Isle Royale	Boston	1	17⅛	19	Sept. '19, SA	.50
Kennecott	New York	19⅜	18⅛	19⅜	Dec. '20, Q	.50
Keweenaw	Boston	1⅜	1⅛	1¼		
Lake Copper	Boston	2⅛	2⅛	2⅛		
La Salle	Boston	1⅛	1⅛	1⅛		
Magma Chief	N. Y. Curb	....	....	*21		
Magma Copper	N. Y. Curb	20⅛	19	20	Jan. '19, Q	.50
Majestic	Boston Curb	*8	*5	*8		
Mason Valley	Boston	1⅛	1⅛	1⅛		
Mass Consolidated	Boston	*90	*70	*80	Nov. '17, Q	1.00
Mayflower-Old Col.	Boston	3⅜	3⅛	3⅜		
Miami Copper	New York	20⅜	18⅛	20⅜	Feb. '21, Q	.50
Michigan	Boston	3	2⅜	3		
Mohawk	Boston	50⅛	48⅛	50⅛	Nov. '20, Q	1.00
Mother Lode (new)	N. Y. Curb	4⅛	4⅛	4⅛		
Nevada Consol.	New York	11⅛	10⅜	11⅛	Sept. '20, Q	.25
New Baltic	Boston Curb	....	....	3		
New Cornelia	Boston	14⅛	13⅛	14⅛	Aug. '20, K	.25
Nixon Nevada	N. Y. Curb	....	....	*5		
North Butte	Boston	11	9⅛	11	Oct. '18, Q	.25
North Lake	Boston	....	....	⅛		
Ohio Copper	N. Y. Curb	....	....	1/16		
Old Dominion	Boston	20	18	19	Dec. '18, Q	1.00
Osceola	Boston	26⅛	24	25⅛	June '20, Q	.50
Phelps Dodge	Open Mar.	†160	†130	....	Apr. '21, Q	1.00
Quincy	Boston	38⅛	37⅛	38⅛	Mar. '20, Q	1.00
Ray Consolidated	New York	13	12⅛	13	Dec. '20, Q	.25
Ray Hercules	Boston Curb	....	....	*35		
St. Mary's Min. Ld.	Boston	36⅜	35	36⅜	June '20, K	2.00
Seneca Copper	Boston	15	15	15		
Shannon	Boston	1	*80	*80	Nov. '17, Q	.25
Shattuck Arizona	New York	6½	5⅛	6	Jan. '20, Q	.25
South Lake	Boston	....	....	1⅛		
Superior Copper	Boston	....	....	3	Apr. '17,	1.00
Superior & Boston	Boston	1⅞	1⅛	1⅛		
Tenn. C. & C. cfs.	New York	8⅛	7⅛	8⅛	May '18, I	1.00
Toulumne	Boston	*43	*43	*43	May '13,	.10
United Verde Ex.	Boston Curb	28	23½	26	Feb '21, Q	.50
Utah Consol.	Boston	4	3⅛	3⅛	Sept. '18,	.25
Utah Copper	New York	52	49	50⅞	Mar. '21, Q	1.00
Utah M. & T.	Boston	1⅜	1⅛	1 1/16	Dec. '17,	.30
Victoria	Boston	1⅛	1⅛	1⅛		
Winona	Boston	*60	*50	*50		
Wolverine	Boston	12⅛	11⅛	12		
NICKEL-COPPER						
Internat. Nickel	New York	15⅛	14⅜	15⅛	Mar. '19,	.50
Internat. Nickel, pf.	New York	...	...	80	Feb. '21, Q	1.50
LEAD						
National Lead	New York	72⅛	71⅛	72⅛	Mar. '21, Q	1.50
National Lead, pfd.	New York	104	104	104	Mar. '21, Q	1.75
St. Joseph Lead	New York	12⅛	11⅞	12	Mar. '21, Q	.25
Stewart Mining	Boston Curb	....	....	*6	Dec. '15,	.05
ZINC						
Am. Z. L. & S.	New York	8⅛	8⅛	8⅛	May '20,	1.00
Am. Z. L. & S. pfd.	New York	27	27	27	Nov. '20, Q	1.50
Butte C. & Z.	New York	4⅜	4⅜	4⅜	June '18,	.50
Butte & Superior	New York	12	11⅛	11⅛	Sept. '20,	1.25
Callahan Zn-Ld.	New York	5⅛	4⅞	5⅛	Dec. '20, Q	.50
New Jersey Zn.	N. Y. Curb	132	126½	126½	Feb. '21, Q	2.00
Success	N. Y. Curb	*3½	*2	*2½	July '16,	.03
Yellow Pine	Los Angeles	....	....	1½	Sept. '20, Q	.03

Stock	Exch.	High	Low	Last		Last Div.
GOLD						
Alaska Gold	New York	1⅛	1	1		
Alaska Juneau	New York	1⅛	1⅛	1⅛		
Carson Hill	N. Y. Curb.	....	....	22⅛		
Cresson Consol. G.	N. Y. Curb	1⅛	1 1/16	1⅛	June '20, Q	$0.10
Dome Extension	Toronto	....	....	*60½		
Dome Mines	New York	19⅛	17	19¼	Apr. '21, Q	.25
Golden Cycle	Colo. Sprgs.	*66	*64	*66	Dec. '20, Q	.02
Goldfield Consol.	N. Y. Curb	*7	*5	*7	Dec. '19,	.05
Hollinger Consol.	Toronto	6.95	6.91	6.94	Feb. '21, M	.05
Homestake Mining	New York	59	59	59	Sept. '19,	.50
Kirkland Lake	Toronto	*49½	*48	*48		
Lake Shore	Toronto	1.14	1.14	1.14	Jan. '21, K	.02
McIntyre-Porcupine	Toronto	1.95	1.91	1.91	Jan. '21, K	.05
Porcupine Crown	Toronto	*21	*21	*21	July '17,	.03
Portland	Colo. Sprgs.	*48	*45	*48	Oct. '20, Q	.01
Reorgan. Booth	N. Y. Curb	*4½	*2	*4	May '19,	.05
Silver Pick	N. Y. Curb	*6	*4	*6		
Teck Hughes	Toronto	*12	*12	*12		
Tom Reed	Los Angeles	1.14	1.11½	1.13	Dec. '19,	.02
United Eastern	N. Y. Curb	2¼	2⅛	2¼	Apr. '21, Q	.15
Vindicator Consol.	Colo. Sprgs.	*19	*19	*19	Jan. '20 Q	.01
West Dome Consol.	Toronto	*6½	*6½	*6½		
White Caps Mining	N. Y. Curb	*7	*6	*7		
Yukon Gold	N. Y. Curb	1	⅞	1	June '18,	.02½
SILVER						
Arizona Silver	Boston Curb	*30	*23	*29	Apr. '20, M	.03
Batopilas Mining	New York	....	....	⅜	Dec. '07, I	.12½
Beaver Consol.	Toronto	*35	*33⅓	*33⅓	May '20, K	.03
Coniagas	Toronto	....	....	1.90	Nov. '20, Q	.12½
Crown Reserve	Toronto	....	....	*16	Jan. '17,	.05
Kerr Lake	Boston	3	3	3	Jan. '21, Q	.12½
La Rose	Toronto	....	....	*23	Apr. '18,	.02
McKinley-Dar.-Sav.	Toronto	....	....	*17	Oct. '20, Q	.03
Mining Corp. Can.	Toronto	1.00	0.95	0.95	Sept. '20, Q	.12½
Nipissing	N. Y. Curb	7	6⅜	6⅜	Apr. '21, Q	.15
Ontario Silver	New York	....	....	4	Jan. '19, Q	.50
Ophir Silver	N. Y. Curb	1⅜	1⅛	1⅜	Jan. '12,	.10
Peterson Lake	Toronto	....	....	*6½	Jan. '17,	.01½
Temiskaming	Toronto	....	....	*24	Jan. '20, K	.04
Trethewey	Toronto	*13¼	*12¼	*12¼	Jan. '19,	.05
GOLD AND SILVER						
Atlanta	N. Y. Curb	1*	*⅜	*1		
Barnes-King	Butte	‡....	....	1.10	Aug. '20, Q	.05
Boston & Montana	N. Y. Curb	*67	*63	*64		
Cashboy	N. Y. Curb	*7	*5	*6		
El Salvador	N. Y. Curb	....	....	⅛		
Jim Butler	N. Y. Curb	*10	*7	*9	Aug. '18, SA	.07
Jumbo Extension	N. Y. Curb	*7	*5	*6	June '16,	.05
Louisiana Con.	N. Y. Curb	....	....	⅛		
MacNamara M.& M.	N. Y. Curb	*14	*13	*14	May '10,	.02½
N. Y. Hond. Rosar.	Open Mar.	†10½	†9	....	Jan. '21, Q	.30
Tonopah-Belmont	N. Y. Curb	1⅛	1⅛	1 1/16	Apr. '21, Q	.05
Tonopah-Divide	N. Y. Curb	1⅛	1 1/16	1⅛		
Tonopah-Extension	N. Y. Curb	1⅛	1 1/16	1 1/16	Apr. '21, Q	.05
Tonopah Mining	N. Y. Curb	1⅛	1⅛	1⅛	Apr. '21, SA	.05
West End Consol.	N. Y. Curb	1	⅞	1	Dec. '19, SA	.05
SILVER-LEAD						
Caledonia	N.Y. Curb	*11⅛	*10	*11	Jan. '21, M	.01
Cardiff M. & M.	Salt Lake	....	....	1.05	Dec. '20,	.15
Chief Consolidated	Boston Curb	2⅛	2⅛	2⅛	Feb. '21, Q	.05
Consol. M. & S.	Montreal	15¼	15	15	Oct. '20, Q	.62½
Daly Mining	Salt Lake	....	....	2.50	July '20, Q	.10
Daly-West	Boston	....	....	3	Dec. '20, Q	.25
Eagle & Blue Bell	Boston Curb	....	....	2⅛	Apr. '21, K	.05
Electric Point	Spokane	*7	*7	*7	May '20, SA	.03
Federal M. & S.	New York	....	....	6⅛	Jan. '09,	1.50
Federal M. & S., pfd.	New York	....	....	23	Mar. '21, Q	1.00
Florence Silver	Spokane	*17	*16	*16	Apr. '19,	.01½
Grand Central	Salt Lake	....	....	*37½	June '20, K	.03
Hecla Mining	N. Y. Curb	3⅛	3 1/16	3⅛	Mar. '21, Q	.15
Iron Blossom	N. Y. Curb	*17	*17	*17	Apr. '20, Q	.02½
Judge M. & S.	Salt Lake	....	....	3.00	Sept. '20, Q	.12½
Marsh Mines	N. Y. Curb	*6	*5	*6		
Prince Consol.	N. Y. Curb	1/16	¼	¼	Nov. '17,	.02½
Rambler-Cariboo	Spokane	*5⅛	*5	*5	Feb. '19,	.01
Rex Consol.	N. Y. Curb	*7⅛	*7	*7⅛		
South Hecla	Salt Lake	*92	*91	*91	Sept. '19, K	.15
Standard Silver-Ld.	N. Y. Curb	1/16	1/16	1/16	Oct. '17,	.05
Tamarack-Custer	Spokane	2.00	1.90	1.90	Jan. '21, K	.04
Tintic Standard	Salt Lake	2.60	2.52½	2.60	June '20, Q	.10
Utah Apex	Boston	2⅛	2 1/16	2⅛	Nov. '20, K	.25
Wilbert Mining	N. Y. Curb	*4	*3	*4	Nov. '17,	.01
QUICKSILVER						
New Idria	Boston	....	....	*95	Jan. '19,	.25
VANADIUM						
Vanadium Corp.	New York	30	28⅛	29⅛	Jan. '21, Q	1.00
ASBESTOS						
Asbestos Corp.	Montreal	72⅛	71⅛	71⅛	Apr. '21, Q	1.50
Asbestos Corp., pfd.	Montreal	....	....	89¼	Apr. '21, Q	1.75
MINING, SMELTING AND REFINING						
Amer. Sm. & Ref.	New York	40⅛	36⅜	40	Mar. '21, Q	1.00
Amer. Sm. & Ref. pf.	New York	76⅛	73⅛	76⅛	Mar. '21, Q	1.75
Am. Sm. pf. A	New Yor	65⅛	63⅛	65⅛	Apr. '21, Q	1.50
U. S. Sm. R. & M.	New York	31⅛	29	30⅛	Jan. '21, Q	.50
U.S.Sm.R.& M. pf.	Boston	41⅛	40⅜	40⅜	Apr. '21, Q	.87½

* Cents per share. † Bid or asked. ‡ Quotations missing. Q, Quarterly. SA, Semi-annually. BM, Bi-monthly. K, Irregular. I, Initial. X, Includes extra.